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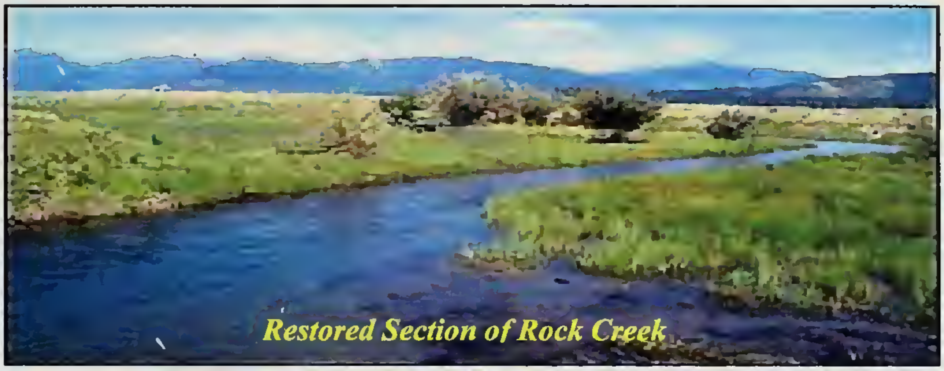
A BASIN-WIDE RESTORATION ACTION PLAN FOR THE BLACKFOOT WATERSHED



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The Blackfoot Watershed Restoration and Monitoring Partners

Prepared by:

The Blackfoot Challenge in partnership with the Big Blackfoot Chapter of Trout Unlimited, Montana Fish, Wildlife and Parks, Hydrometrics Inc., and other partners

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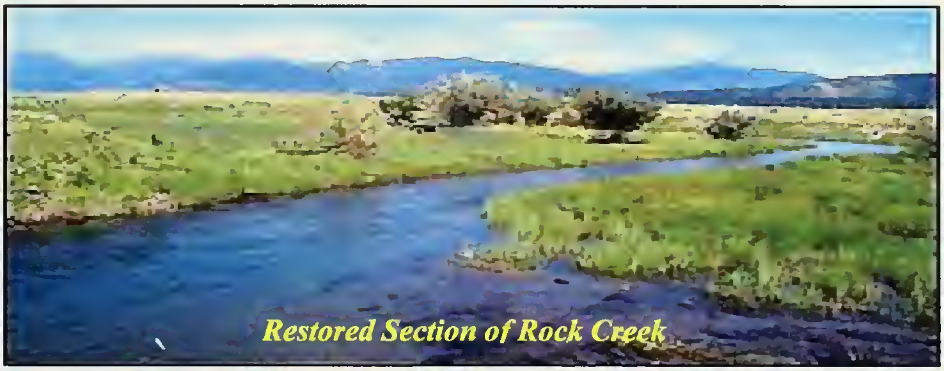

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EXECUTIVE SUMMARY

The Blackfoot River Watershed has been the focus of a rapidly expanding stream restoration program over the past several years, with a growing number of organizations and entities involved in restoration planning and implementation in the Watershed. These restoration activities are being implemented under a number of regulatory programs and mandates, and restoration program objectives. This growth in restoration activities in the Blackfoot Watershed has prompted the need for a guiding document to strengthen restoration partnerships and programs through pooling of resources, greater information sharing, and the creation of a restoration network. This Restoration Action Plan has been developed through a collaborative effort by the Blackfoot River restoration partners to meet these needs for restoration activities throughout the Blackfoot Watershed.

The goal of this Action Plan is to define strategies for prioritization, planning and implementation of restoration projects for impaired and dewatered streams in the Blackfoot Watershed. The Plan is also intended to assist project planners in selection and implementation of appropriate monitoring strategies for assessing the effectiveness of restoration projects regarding attainment of restoration goals. This Action Plan serves as a restoration guide for partners by identifying opportunities for cooperative restoration and monitoring efforts, promoting implementation of restoration strategies identified in various programs and directives, promoting restoration monitoring to assess effectiveness; and creating a tracking system for completed restoration projects and associated monitoring.

This Action Plan encompasses three established restoration programs currently operating in the Blackfoot Watershed, including: 1) Native fish species management and recovery led by MT FWP and Big Blackfoot Chapter of Trout Unlimited (BBCTU); 2) The TMDL Program led by MDEQ and the Blackfoot Challenge; and 3) Water conservation and instream flow management led by BBCTU and the Blackfoot Challenge. A total of 127 streams were examined during the development of this Action Plan. The results show overlap as well as differences between the restoration program areas. About half (64) of the streams identified in this Action Plan as being in need of restoration fall within multiple program areas and represent excellent opportunities for collaborative restoration projects (Table 1-1). The Action Plan is a flexible document that allows for the integration of other restoration programs and directives. While the three existing restoration programs will likely address the majority of restoration needs in the Blackfoot, it is recognized that there may be other considerations and restoration needs beyond those outlined in this plan, such as restoration opportunities related to NRCS agricultural programs.

Strong partnerships between landowners (private and corporate), state and federal agencies, and private entities (like the Blackfoot Challenge and BBCTU) are a primary reason for the success of restoration efforts to date in the Blackfoot Watershed. Implementation of this Action Plan will help solidify these partnerships and strengthen the collaborative approach to restoration that has flourished in the Watershed. This Action Plan is intended to foster these partnerships through the identification and implementation of cooperative restoration projects that meet multiple programmatic goals and objectives.

Implementation of this Action Plan will include annual meetings of the restoration partners, beginning in 2005. The primary purpose of the annual meetings will be to review ongoing restoration projects and associated monitoring activities in the Watershed, and plan upcoming restoration-related activities. The Action Plan will be modified as necessary, including updating the inventory of completed and upcoming restoration projects, updating the restoration project priority list, and incorporating other modifications deemed appropriate by the Blackfoot Watershed restoration partners.

A BASIN-WIDE RESTORATION ACTION PLAN FOR THE BLACKFOOT WATERSHED

1.0 INTRODUCTION

The Blackfoot watershed encompasses 2,320 square miles of biologically rich and diverse lands in western Montana (Figure 1-1). The Blackfoot River drainage system provides critical fish and wildlife habitat, irrigation water for agricultural lands, domestic water use, and high quality recreational opportunities for the public -- all beneficial uses dependent upon clean water.

Since 1990, restoration partners in the Blackfoot watershed have undertaken cooperative habitat restoration tied to fisheries with over 200 projects completed to date involving more than 100 individual landowners (Appendix A). However, as the number of habitat and water quality programs and projects has grown over time, the need has emerged for a more clearly defined comprehensive watershed-wide restoration program. Much of this need is brought on by opportunities and requirements associated with a variety of local, state, and federal programs, plans, and directives involving fisheries management and recovery, long-term water conservation and drought management, and the State of Montana Total Maximum Daily Load (TMDL) program. Through restoration planning and implementation under these various programs, it has become apparent that better coordination between the various entities performing restoration in the watershed is needed. As a result, this restoration action plan has been developed to help partners work more closely together, pool resources, and meet common goals.

This Action Plan is intended to serve as a guidance document for restoration planning, implementation and monitoring in the Blackfoot Watershed. It serves as a planning tool for identifying, prioritizing and coordinating restoration activities in the Blackfoot watershed. The plan provides a comprehensive resource-based, priority-driven strategy for project planning and expands upon the experience and success of existing restoration programs in the watershed. Restoration planning in this document is organized by the three primary restoration programs currently operating within the watershed, including:

1. The Fisheries Management and Recovery Program overseen primarily by FWP;
2. The Blackfoot Water Conservation and Drought Management Program; and
3. The State of Montana Total Maximum Daily Load (TMDL) program.

This Action Plan has been prepared as a collaborative effort between the Blackfoot Challenge and its partners with major contribution from the Montana Fish, Wildlife and Parks and Hydrometrics Inc. Grant support has been provided by the Montana Department of Natural Resources and Conservation's Renewal Resource Grant and Loan Program (RRGL) and the Chutney Foundation. In-kind support has been provided by all the partners identified in Section 2.3. The Action Plan will be used to guide selection of priority

collaborative projects and will be updated as needed to provide a mechanism for obtaining a more consistent and higher level of funding for on-the-ground restoration projects.

1.1 GOALS AND OBJECTIVES

The goal of this Restoration Action Plan is to define the strategies for prioritization, development, implementation, and monitoring of water quality, habitat and fisheries restoration projects for impaired and dewatered streams of the Blackfoot Watershed. The Action Plan addresses restoration needs or causes of water quality impairment in three primary categories: 1) Fisheries and stream restoration needs; 2) Stream dewatering affecting fisheries and other beneficial uses; and 3) restoration needs/opportunities identified through the Montana Department of Environmental Quality (MDEQ) Total Maximum Daily Load (TMDL) program. These strategies in turn will be used to direct restoration efforts, secure implementation funding, and coordinate stakeholder involvement.

To ensure that this overall goal is met, Action Plan Objectives have been developed and include:

- Identify opportunities for collaborative restoration project and monitoring efforts;
- Promote implementation of restoration strategies identified through native species management/recovery plans, the TMDL program, and the Blackfoot water conservation and in-stream flow plans within the framework of the Action Plan;
- Outline restoration monitoring strategies, including monitoring protocols, to promote consistent and adequate monitoring for assessing restoration project effectiveness; and
- Create a tracking system for completed and planned restoration projects as well as the monitoring associated with these projects.

1.2 REPORT SCOPE AND FORMAT

The Restoration Action Plan incorporates the plan objectives as well as the various restoration programs currently operating within the watershed. The primary components of the Action Plan include the action plan implementation process, the TMDL-related restoration strategies, and the fisheries/dewatering-related restoration strategies, with each component described in a separate section of the Action Plan. The report is organized as follows:

- Section 1 contains report objectives, a general description of the Blackfoot watershed characteristics, an overview of impairment issues, and results and conclusions;
- Section 2 describes the action plan implementation process, participating partners, role of partners, and potential funding sources for projects and monitoring;
- Section 3 contains a summary of TMDL issues and 303(d)-listed streams in the watershed, and discussion of potential TMDL-related restoration projects;
- Section 4 covers fisheries and stream dewatering issues including a summary of the existing fishery, which is a driving factor in most of the restoration planning in the drainage; and

- Section 5 contains a prioritization scheme for watershed-wide fisheries-related restoration needs based on several ranking criteria including drought-related impairment conditions and the results of the prioritization.

In addition to the sections described above, the following appendices provide further support for the three program areas of the Action Plan:

- Appendix A provides a table and map of restoration projects completed since 1990;
- Appendix B provides a list of ongoing and potential TMDL-Related Restoration Projects in the Blackfoot;
- Appendix C contains descriptions of near-term restoration projects in the Blackfoot watershed;
- Appendix D provides a summary of 108 streams identified in the fisheries prioritization process including, for each stream, a description, the TMDL issues and 303(d) status, dewatering issues, native species issues, restoration activities, and monitoring activities;
- Appendix E is the Fisheries Prioritization Matrix;
- Appendix F contains a strategy for monitoring restoration effectives using the Restoration Monitoring Protocols; and
- Appendix G provides a bibliography of relevant guiding documents for the Restoration Action plan and document references.

1.3 WATERSHED CHARACTERISTICS

The following watershed characterization is intended to provide readers unfamiliar with the Blackfoot Watershed with a general understanding of the watershed setting and physical characteristics necessary for assessing restoration needs and priorities in the watershed.

The Blackfoot Watershed, situated in western-central Montana, encompasses 1.5 million acres of diverse lands. The headwaters to the Blackfoot River originate atop the continental divide at Rogers Pass at the junction of Beartrap and Anaconda Creeks. The river flows westerly 132 miles to its confluence with the Clark Fork River at Bonner, east of Missoula, MT. The northern portion of the watershed is dominated by the Clearwater River and the North Fork of the Blackfoot subdrainages, while the southern watershed is dominated by Nevada Creek and Poorman Creek subdrainages (Figure 1-1).

This river system drains a 2,320 square mile watershed through a 3,700-mile stream network of which 1,900 miles are perennial streams capable of supporting fishes. Mean annual discharge is 1,607 cubic feet per second (cfs). The physical geography of the watershed ranges from high-elevation glaciated alpine meadows, timbered forests at the mid-elevations to prairie pothole topography on the valley floor. Glacial deposits, mainly glacial till, outwash and glacial lake sediments, cover much of the Blackfoot River valley floor and exert a controlling influence on the geomorphology of the Blackfoot River and the lower reaches of most tributaries. The Blackfoot River is a free flowing river to its confluence with the Clark Fork River where Milltown dam, a run-of-the-river hydroelectric facility, creates Milltown Reservoir. Milltown dam has blocked upstream fish passage on the Clark Fork

River, affecting natural migrations between the Clark Fork River and Blackfoot River since 1907. The dam is scheduled for removal in 2006.

Land ownership in the Blackfoot watershed is 60% public, 20% corporate timber, and 20% privately owned ranches. In general, public lands and large tracts of corporate timber properties comprise large forested tracts in mountainous areas of the watershed while private lands occupy the foothills and lower valley areas (Figure 1-1). About 1/3 of the corporate timber lands are being resold to public agencies and adjacent private land-owners as part of the Blackfoot Community Project that aims to maintain traditional uses such as recreation, timber management, grazing and wildlife habitat. Traditional land-use in the basin includes mining, timber harvest, agriculture and recreation activities, all of which provide the economic base of the Blackfoot Valley. Unfortunately to various degrees, these activities have also contributed to water quality and habitat degradation or fish population declines.

1.3.1 Impairment Issues

The Blackfoot River and its tributaries provide critical fish and wildlife habitat, water for domestic consumptive use and agriculture (crops and livestock), and countless recreational opportunities. Maintaining and improving water quality is essential to continuing these beneficial water uses. The major water quality impairment issues identified in the Blackfoot Watershed include excess sediment and siltation, habitat alterations, flow alterations, elevated water temperature, and elevated nutrients and metals concentrations. Siltation and aquatic habitat alterations are the most common causes of water quality impairment on the 36 303(d) listed streams in the Blackfoot. Water quality impairment results from a wide array of land use practices such as mining, excessive riparian timber harvest, riparian grazing management, poorly designed roads, non-point source agricultural runoff, stream dewatering, and channel alterations. The natural complexity of the Blackfoot River system also contributes to impairments. Naturally high sediment production, low stream flows and drought prone areas, and other natural factors account for some impairment issues and compound problems when combined with human influences. The impacts of poor water quality are most often reflected in the health of fisheries as they are the most immediately impacted resource and provide a measure of overall watershed health. To a lesser extent water quality can affect recreational uses, crop yield, wildlife health, and livestock survival. In severe cases, poor water quality can limit drinking water availability. Regardless of impacts, the goal of this Action Plan is to maintain and improve water quality so that all beneficial uses are supported.

Within the Blackfoot Watershed, the great majority of inventoried streams exhibit some level of physical and biological impairment. The level of impairment varies significantly within and among streams. Fisheries related impairments represent the majority of restoration needs in the Blackfoot watershed. Functional tributaries play essential roles in the life stages (migration, spawning and rearing) of all fluvial Blackfoot River fish. Altered and degraded tributaries generally inhibit movement and reduce spawning and rearing success, which contributes to suppressed populations and inadequate recruitment of multiple species over large areas of the river. The sum of natural and human variables produces a diverse array of

wild fish communities that vary in species composition and overall population densities among river reaches.

Stream dewatering occurs naturally but is primarily caused by human activity. Agriculture plays a large role in the economy and lifestyle of the Blackfoot basin. Water is diverted from the Blackfoot River and its tributaries for crop and livestock production. Coupled with the effects of an extended drought, stream dewatering is of great concern to both fisheries and water quality. Lack of instream flows from dewatering and drought increases water temperature, limits fish passage, reduces survival, and increases the spread of diseases among fish. In addition, lack of instream flows limits the transportation of sediment, nutrients, and metals through the system leading to higher concentrations of these materials and impairments to water quality. By improving water use efficiency, especially during drought years, issues related to stream dewatering can be minimized while maintaining water uses for agriculture.

Although the Action Plan identifies a significant number of impaired streams, it should not be considered a complete list of restoration needs in the Blackfoot basin. For this reason, the Action Plan will undergo periodical updating and represents an adaptive approach to restoration planning that incorporates changing conditions and current information to ensure continued success in restoration efforts in the Blackfoot watershed.

1.4 RESULTS AND CONCLUSIONS

A total of 127 water bodies (streams, stream segments, river reaches, and lakes) were examined in this Action Plan (Figure 1-2). There is overlap and noticeable differences between the three program areas as shown in Table 1-1. The 108 "fisheries restoration priority" streams represent the majority of the list (85%). Fifty-four streams are included on the dewatered stream list (43%) and 36 streams are identified as impaired on the 303(d) list (28%). Forty-four of the streams fall exclusively under the fisheries restoration program (35%) and sixty-four streams (50%) are found in multiple program categories. The following analysis of the programs offers numerous considerations and opportunities for cooperative restoration projects.

Of the 127 total streams, 22 streams (17%) are included in all three restoration programs (fisheries priority, TMDL and dewatered streams). Eight of these streams ranked high on the fisheries prioritization while another eight ranked as moderate. The remaining six streams ranked low (Table 1-1).

There is a strong correlation between the TMDL and fisheries restoration program. Of the 36 streams or stream segments identified on the TMDL list, 33 streams (92%) are also included in the fisheries restoration program. Twelve of the TMDL streams ranked high, twelve ranked moderate, and nine streams ranked low on the fisheries prioritization list. The three 303(d) listed streams not included on the fisheries prioritization list include Beartrap Creek, Braziel Creek, and Sandbar Creek. Although 78 streams listed in the fisheries program are not included in the TMDL program, it should be noted that many of these streams are

tributaries to 303(d) listed water bodies and can be considered for restoration under the TMDL program as part of a comprehensive approach to water quality restoration.

Approximately 61% (22 of 36) of the TMDL streams are also found on the dewatered streams list (Table 1-1). None of the total streams fall exclusively in these two program areas. These 22 streams are the same streams that are common to all three program areas.

All but one of the dewatered streams were also listed under the fisheries restoration program (Dry Fork). Of these streams 23 ranked high on the fisheries prioritization while 15 streams ranked moderate and 15 ranked low.

Several collaborative restoration opportunities and possibilities for program integration are presented in this Action Plan. Sixty four of the streams listed in this Action Plan are found in multiple program areas and could be considered as good opportunities to address more than one impairment issue. Table 1-1 also shows that 25 restoration projects involving various partners will be implemented in 2005 and 2006. These projects address restoration needs identified in all three program areas. Appendix C contains more detailed descriptions of these projects that have been provided by partners. Once these projects are completed, they will be included in the inventory of completed projects. In the future, Appendix C will serve as an inventory of developed projects that will be implemented or are in need of funding.

Using this information for collaborative restoration projects will require commitment and coordination from the partners. This Action Plan is an initial step towards a watershed wide restoration program. As new programs and directives emerge, the Action Plan and partners will need to evolve to facilitate growing restoration needs.

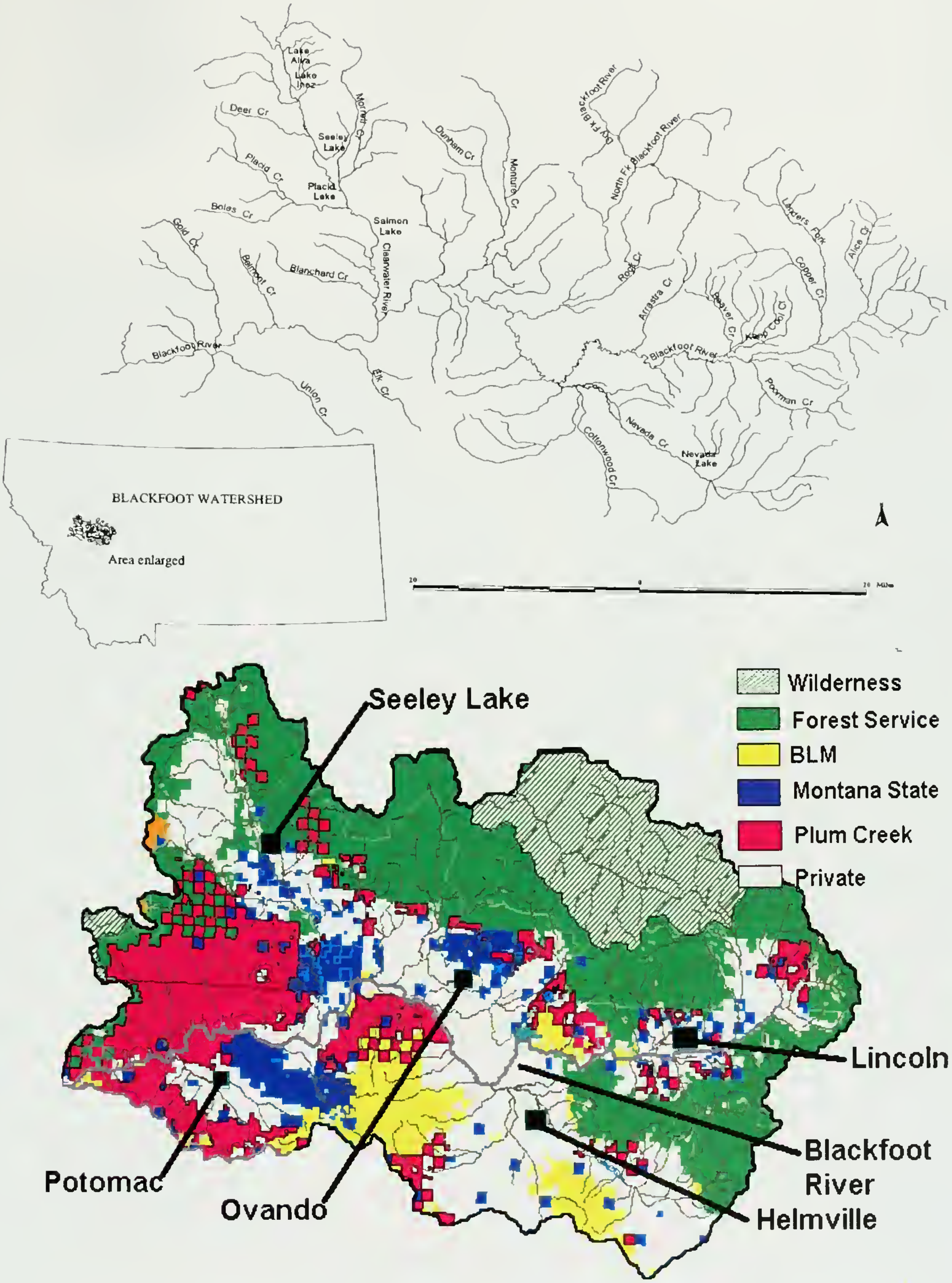

FIGURE 1-1. THE BLACKFOOT RIVER WATERSHED (ABOVE) AND LAND OWNERSHIP (BELOW).

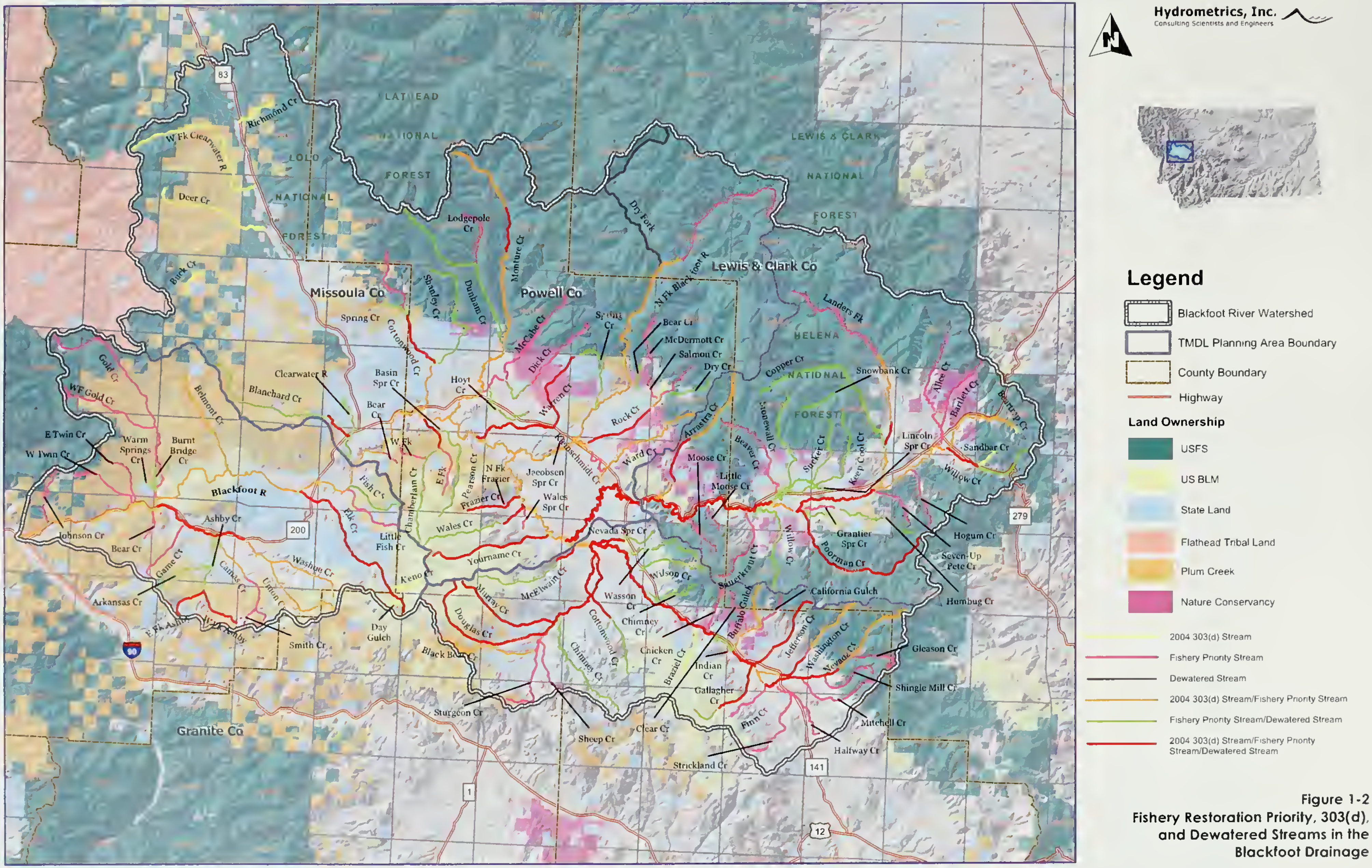

Figure 1-2
Fishery Restoration Priority, 303(d), and Dewatered Streams in the Blackfoot Drainage

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TABLE 1-1. CORRELATION BETWEEN 127 FISHERIES, TMDL, AND DEWATERED STREAMS IN THE BLACKFOOT WATERSHED

Stream Name	TMDL Planning Area	Fisheries Stream	Dewatered Streams	303(d) Listed Streams	Fisheries Priority Ranking	Completed Projects	2005 - 2006 Projects
Alice Creek	BFH	x			H-10		
Arkansas Creek	LBF	x	x		L-19		
Arrastra Creek	BFH	x	x	x	M-13		BBCTU/BC/FWP/DEQ
Ashby Creek	LBF	x	x		L-17		LO/FVLT/BBCTU/NRCS
Bartlett Creek	BFH	x			L-20		
Basin Creek	MBF	x			M-16		
Bear Creek (RM 12.2)	LBF	x			M-11	x	
Bear Creek (RM 37.5)	MBF	x			L-17		
Bear Creek (trib to NF)	MBF	x	x		L-21		
Beartrap Creek	BFH			x	NR		Asarco
Beaver Creek	BFH	x			H-4	x	
Belmont Creek	LBF	x		x	H-4	x	
Black Bear Creek	NC	x		x	M-16		
Blackfoot River - 1	BFH	x	x	x	H-9		Asarco
Blackfoot River - 2	BFH	x		x	H-9	x	
Blackfoot River - 3	BFH	x		x	M-11	x	
Blackfoot River - 4	MBF	x	x	x	H-9		
Blackfoot River - 5	MBF	x		x	M-13		
Blackfoot River - 6	LBF	x		x	M-16	x	
Blanchard Creek	MBF	x	x	x	H-7	xxx	
Braziel Creek	NC			x	NR		
Buck Creek	MBF			LSCD	NR		
Buffalo Gulch	NC	x		x	L-19		
Burnt Bridge Creek	LBF	x	x		L-23		
California Gulch	NC	x			L-19		
Camas Creek	LBF	x		LSCD	L-17		
Chamberlain Creek	MBF	x	x	FS	H-10	x	LO/BBCTU/DNRC
Chamberlain Creek (EF)	MBF	x			M-15		
Chamberlain Creek (WF)	MBF	x			L-17		
Chicken Creek	NC	x			L-17		
Chimney Creek (Douglas)	NC	x	x		L-17	x	
Chimney Creek (Nev)	NC	x	x		L-24		
Clear Creek	NC	x			L-23		
Clearwater River	MBF	x	x		M-13	x	LO/BBCTU/FWP/USFWS
Copper Creek	BFH	x	x		H-7		
Cottonwood Creek (RM 43)	MBF	x	x	FS	H-3	xxxxxx	USFS/BBCTU
Cottonwood Creek (Nev)	NC	x		x	L-19	x	
Day Gulch	LBF			LSCD	NR		
Deer Creek	MBF			FS	NR		
Dick Creek	MBF	x	x		H-3	x	LO/NRCS/BBCTU
Douglas Creek (Upper)	NC	x	x	x	M-13	x	
Douglas Creek (Lower)	NC	x	x	x	M-13		LO
Dry Creek	MBF	x	x		M-11	xx	LO/FVLT
Dry Fork	MBF		x		NR		
Dunham Creek	MBF	x	x		H-6	xx	
East Fork Ashby	LBF			LSCD	NR		
East Twin Creek	LBF	x			M-12	x	
Elk Creek (Upper)	LBF	x	x	x	H-8	x	
Elk Creek (Lower)	LBF	x	x	x	H-8	x	

TABLE 1-1. CORRELATION BETWEEN 127 FISHERIES, TMDL, AND DEWATERED STREAMS IN THE BLACKFOOT WATERSHED

Stream Name	TMDL Planning Area	Fisheries Stream	Dewatered Streams	303(d) Listed Streams	Fisheries Priority Ranking	Completed Projects	2005 - 2006 Projects
Finn Creek	NC	x			L-18		
Fish Creek	LBF	x	x		M-13		
Frazier Creek	MBF	x	x	x	L-20		
Frazier Creek (NF)	MBF	x	x		L-23		
Gallagher Creek	NC	x	x	x	L-20		
Game Creek	LBF	x			L-20		
Gleason Creek	NC	x			L-23		
Gold Creek (WF)	LBF	x			H-5		
Gold Creek	LBF	x			H-6	x	
Grantier Spring Creek	BFH	x			M-16	x	
Halfway Creek	NC	x			L-18		
Hogum Creek	BFH	x			M-15		
Hoyt Creek	MBF	x	x		H-8	x	LO/BBCTU/BC/NRCS
Humbug Creek	BFH	x	x		L-20		LO/BBCTU
Indian Creek	NC	x			L-22		
Jacobsen Spring Creek	MBF	x			M-14		LO/NRCS/BBCTU
Jefferson Creek (Upper)	NC	x	x	LSCD	L-19		
Jefferson Creek (Lower)	NC	x	x	x	L-19		
Johnson Creek	LBF	x			M-12	x	
Keep Cool Creek	BFH	x	x		M-12		
Keno Creek	LBF				NR		
Kleinschmidt Creek	MBF	x		x	H-5	xx	(2) LO/NRCS/BBCTU
Landers Fork	BFH	x	x	FS	H-2		
Lincoln Spring Creek	BFH	x			M-13		
Little Fish Creek	LBF	x			M-11		
Little Moose Creek	BFH	x			L-17		
Lodgepole Creek	MBF	x			M-11		
McCabe Creek	MBF	x	x		H-9	xx	
McDermott Creek	MBF	x			L-23		
McElwain Creek	NC	x	x	LSCD	H-10		
Mitchell Creek	NC	x			L-18		
Monture Creek	MBF	x	x	x	H-1	xxx	LO/NRCS
Moose Creek	BFH	x			M-15		USFS/BBCTU
Murray Creek	NC	x	x	LSCD	L-17		
Nevada Creek (Upper)	NC	x	x	x	M-14	x	LO/NRCS/BC/DEQ
Nevada Creek (Lower)	NC	x	x	x	L-19	x	LO
Nevada Spring Creek	NC	x	x	x	M-11	xxxx	LO/NRCS
Nevada Lake	NC			LSCD	NR		
North Fork Blackfoot River	MBF	x		FS	H-1	xxxxxx	
Pearson Creek	MBF	x	x		M-12	x	LO/NRCS
Poorman Creek	BFH	x	x	x	H-2	xxxxxx	
Richmond Creek	MBF			FS	NR		
Rock Creek	MBF	x	x	x	H-4	xxxx	LO/NRCS/FVLT
Salmon Creek	MBF	x			H-10	xx	
Salmon Lake	MBF			FS	NR		
Sandbar Creek	BFH			x	NR		
Sauerkraut Creek	BFH	x			M-12		
Seeley Lake	MBF			FS	NR		
Seven Up Pete Creek	BFH	x			M-16		

TABLE 1-1. CORRELATION BETWEEN 127 FISHERIES, TMDL, AND DEWATERED STREAMS IN THE BLACKFOOT WATERSHED

Stream Name	TMDL Planning Area	Fisheries Stream	Dewatered Streams	303(d) Listed Streams	Fisheries Priority Ranking	Completed Projects	2005 - 2006 Projects
Shanley Creek	MBF	x	x		H-10	x	
Sheep Creek	NC	x			L-17		
Shingle Mill Creek	NC	x			L-20		
Smith Creek	LBF	x			L-24		
Spring Creek (Cottonwood)	MBF	x	x		H-10		
Spring Creek (NF)	MBF	x	x		H-8	x	LO/BBCTU/NRCS
Snowbank Creek	BFH	x	x		H-6		
Strickland Creek	NC	x			L-21		
Stonewall Creek	BFH	x	x		H-10		
Sturgeon Creek	NC	x			L-18		LO
Sucker Creek	BFH	x	x		M-14		
Union Creek	LBF	x	x	x	M-14	x	
Wales Creek	MBF	x	x	LSCD	M-12		
Wales Spring Creek	MBF	x			H-10		
Ward Creek	MBF	x		x	L-21		LO/BC/BBCTU/EPA
Warm Springs Creek	LBF	x	x		L-17		
Warren Creek	MBF	x	x	x	H-7	xx	LO/BC/BBCTU/NRCS/EPA
Warren Creek (Doney Lake)	MBF	x			L-22		
Washington Creek (Upper)	NC	x	x	x	L-19		
Washington Creek (Lower)	NC	x	x	x	L-19		
Washoe Creek	LBF	x		LSCD	L-18		
Wasson Creek	NC	x	x		H-10	x	LO/BBCTU/BC/NRCS/FWP/EPA
West Fork Ashby Creek	LBF			LSCD	NR		
West Fork Clearwater River	MBF			FS	NR		
West Twin Creek	LBF	x			M-12	x	
Willow Creek (Upper)	BFH	x		x	M-14		
Willow Creek (Lower)	BFH	x	x		H-7		
Wilson Creek	NC	x	x		M-14		
Yourname Creek	MBF	x	x	x	M-11		
Totals		108	54	56 - Total	35 - High		
				36 - Listed	35 - Moderate		
				11 - LSCD	42 - Low		
				9 - FS	15 - Not ranked		

127 Water Bodies (streams, stream segments, river reaches, and lakes)
108 streams and stream segments on the fisheries priority list (85%). 34 streams rank high, 34 moderate, and 40 low.

54 streams and stream segments on the dewatered list (43%). 23 streams rank high, 15 moderate, 15 low, and 1 unranked
Dry Fork is the only dewatered stream not ranked

36 water bodies on the TMDL list. An additional 11 streams LSCD and 9 streams are fully supporting (28%). Of the 36 listed TMDL streams 12 rank high, 12 moderate, 9 low, and 3 are unranked (Beartrap, Braziel, and Sandbar Creeks).

44 streams fall exclusively under the fisheries category (35%)
64 streams fall under multiple categories (50%)
22 streams and stream segment fall under all three categories (17%). 8 rank high, 8 moderate, and 6 low
53 of the 54 (98%) dewatered streams are also on the fisheries list. 23 rank high, 15 moderate, and 15 low.
33 of the 36 listed TMDL streams (92%) are found on the fisheries list. 12 rank high, 12 moderate, and 9 low
22 of the 36 TMDL streams (61%) are also found on the dewatered list. 8 rank high, 8 moderate, and 6 low

2.0 ACTION PLAN IMPLEMENTATION PROCESS

Interagency cooperation, fostering of partnerships, and adoption of a watershed approach have helped stakeholders in the Blackfoot Watershed address natural resources issues such as weed infestation, wildlife management, drought management, and growth and development. It is this collaborative approach that has led to the development of this Action Plan. The Action Plan will be implemented through this environment of cooperation and partnerships in order to effectively address fisheries, TMDL, and stream dewatering restoration needs on both private and public lands. Implementation of this Action Plan will help strengthen and expand the partnership and its restoration programs.

2.1 ACTION PLAN IMPLEMENTATION APPROACH

Approaches to stream restoration under this current version of the Action Plan are a result of the Action Plan goals and objectives as well as restoration approaches inherent to the current restoration programs operating in the watershed (i.e., native fish conservation, water conservation, and the TMDL program). These programmatic approaches are a driving force in restoration planning in the watershed, dictating such key restoration elements as project identification, selection, prioritization and design. Following is a summary of the general approaches to restoration planning and implementation covered by this Action Plan. These approaches are based on current restoration priorities and program needs, but may change in the future as these priorities and needs change in response to future restoration successes, other restoration programs, or as other relevant information becomes available within the watershed.

2.1.1 Tributary Focus

Problems in mainstem Blackfoot River fisheries generally result from tributary impairments. As a result, stream restoration activities in the Blackfoot Watershed have focused on fisheries-sensitive tributaries rather than the Blackfoot River mainstem. Because tributaries are critical to native fish spawning and survival and the impaired tributaries act as a source of impairment to the Blackfoot River, this tributary approach to watershed restoration has proven to be successful at meeting the watershed restoration goals and objectives including improvements to native fish populations. Therefore, the current focus of tributary restoration in the three primary restoration programs operating in the drainage are expected to continue. As more tributaries are successfully restored, restoration needs and opportunities on the mainstem Blackfoot River may be considered where relevant. Likewise, future restoration activities may focus on lakes and wetlands within the watershed.

2.1.2 Partnership Building

Strong partnerships are a primary reason for the success of restoration in the Blackfoot and continuing these partnerships is crucial to future efforts. Through this Action Plan, partnerships are strengthened by integration of the three primary restoration programs currently operating in the watershed, more systematic sharing of information, and increased opportunities for cooperative projects. It is fully recognized that participating partners will

continue to pursue individual projects based on their priorities, mission, and directives. This Action Plan is not intended to supersede individual organization's restoration priorities and activities, but to create a "restoration network" that provides assistance to partners, limits duplicative efforts and associated inefficiencies, and helps multiple partners operating within the watershed meet their restoration goals and objectives through cooperative project planning, development, implementation, and monitoring.

2.1.3 Landowner Cooperation

Due to the fact that significant levels of watershed impairment issues occur on private land, cooperation with private landowners is critical to the continued success of restoration programs in the Blackfoot. Over 200 private landowners have completed restoration projects in the Blackfoot and much of the restoration still needing to be undertaken is on private lands. Given the strong stewardship history and ethic, the Action Plan relies on the sustained private-public partnership that has been built since the 1970's in the Blackfoot Watershed.

2.2 IMPLEMENTATION PROCESS

In order to facilitate and coordinate activities under this Action Plan, a partners committee will be formed. The Blackfoot Watershed Restoration Partners will meet yearly to review and update the Action Plan and to coordinate known projects. The Partnership will meet more often if needed and as funding opportunities arise. The partners will be requested to:

- Update the summary of fisheries priority streams, TMDL projects, and dewatered streams;
- Maintain the consolidated list of assessed streams and short-term and mid-term proposed projects;
- Review projects initiated and/or completed during each year ;
- Identify candidate projects for design development, fund raising, and implementation over next 2-5 years;
- Update the inventory of completed projects and completed monitoring; and
- Review and update the monitoring restoration protocol.

The following factors will be used by the Restoration Partners in reviewing and selecting cooperative projects:

- Timeliness of Project – Is project ready to be implemented, has a design been prepared, are landowner agreement in place, are permits approved?
- Funding Appropriateness – Is the project eligible for funding?
- Design – Is the project design adequate to meet intended restoration objectives?
- Partners – Are there multiple partners willing to seek/fund project?
- Restoration Goals and Objectives – Does the proposed project have clearly defined goals and objectives? Can goals and objectives be reasonably met, and does the project address the identified source of the problem rather than a symptom?
- Monitoring – Has a monitoring plan been developed, do partners agree on appropriateness of monitoring?

2.3 PARTICIPATING PARTNERS

As noted above, development and maintenance of strong partnerships is a key element to the Action Plan restoration approach. Past restoration successes in the Blackfoot Watershed have been possible through the efforts of several public and private entities, exemplifying the cooperative nature of land use planning over the past several years. Partners involved in past restoration planning and implementation include: the Blackfoot Challenge and its Habitat and Water Quality Restoration Committee; Big Blackfoot Chapter of Trout Unlimited (BBCTU); Montana Fish, Wildlife and Parks (FWP); US Fish and Wildlife Service Partners for Fish and Wildlife Program (USFWS); Natural Resource Conservation Service (NRCS); US Forest Service (USFS); Bureau of Land Management (BLM); Lewis and Clark, Powell, and Missoula County Conservation Districts; Montana Department of Natural Resources (DNRC); Montana Department of Transportation (MDT); Plum Creek Timber Company (PCTC); Five Valleys Land Trust (FVLT); and others. These partnerships have also played significant roles in stream restoration planning and implementation in the watershed.

In addition to the partners listed above, the following partners have contributed substantially to the development of monitoring protocols and programs: Montana Fish, Wildlife and Parks; US Geological Survey (USGS); Montana Department of Environmental Quality (DEQ); US Environmental Protection Agency (EPA); Hydrometrics, Inc.; Land Water Consulting, Inc.; McNeal Resources; and the Blackfoot Challenge Monitoring Work Group.

2.4 ROLE OF PARTNERS

The Blackfoot Challenge will be responsible for organizing and coordinating the annual Blackfoot Watershed Restoration Partners Committee meeting as well as periodic Restoration Partners and Land Stewards meetings. The Challenge will also coordinate updates to the Restoration Action Plan Report, and through its Habitat and Water Quality Restoration Committee, will involve restoration partners in the TMDL planning and implementation grant requests. The Challenge, through its Monitoring Work Group, will assist in review and provide input on pre- and post-project monitoring protocols, and will assist partners in obtaining funding for restoration projects through grant writing assistance or other means.

The Big Blackfoot Chapter of Trout Unlimited (BBCTU) will co-host annual Restoration Action Plan meetings and will participate in other cooperative restoration meetings. BBCTU will take a lead in maintaining the database and inventory of completed restoration projects, proposed restoration projects, and priority streams list. BBCTU will host monthly Fisheries and Habitat Committee meetings and take a lead in landowner contacts, project identification, contracting for design of restoration projects, as well as oversee project implementation, and project monitoring in the watershed. BBCTU will also take the lead on coordinating grant writing.

Montana Fish, Wildlife and Parks (FWP) will participate in Restoration Action Plan meetings and take the lead on maintaining the Summary of Priority Streams portion of the

Action Plan and periodic updates to stream prioritization, report on monitoring activities, and advise on fisheries monitoring protocols. FWP will develop projects and grant proposals, and oversee projects funded through FWP.

Given the history of this partnership, it is expected that the other partners listed in Section 2.2 will continue to contribute to restoration efforts and the implementation of this Action Plan. These contributions are expected to include: participation in Restoration Partnership meetings; providing technical assistance for the identification, development, and prioritization of restoration projects; providing technical assistance to project designs and monitoring plans; developing and overseeing projects funded by their respective agencies or organizations; assist with private landowner contacts as necessary; advise on grant funds available and assist with grant writing proposals for restoration and monitoring; and provide funding for primary field staff as necessary to help meet restoration program demands.

2.5 FUNDING PROGRAMS

Most restoration projects undertaken in the Blackfoot are cost-shared by multiple partners. The Restoration Partners agree to meet periodically to coordinate grant applications with the goal of a higher level of funding for on-the-ground conservation projects. The Restoration Partners will communicate and coordinate regarding funding from the sources listed in Table 2-1. New funding sources will be added to Table 2-1 as they are identified. Currently identified grants and funding sources are subject to change.

TABLE 2-1. RESTORATION PLANNING, PROJECTS AND MONITORING FUNDING SOURCES

Agency/Grant Program	Contact	Amount	Limits Per Application	Source	Funding Cycle	Application Due Dates	Who Can Apply	Description
DEQ 319 Program	Rob Rung rrung@mt.gov	1.5 million annually	Not specified	Federal	Annual	Draft 10/1 Final 12/1	Government Entities and Non-profit Organizations	protection, improvement, or planning; 4 categories of applications - Watershed TMDL Planning, Watershed Restoration, Groundwater, and Information/Education
MT FWP Future Fisheries	Mark Lere 406-444-2432	~$750,00 annually	Not specified	State	6 months	Jan 1 and July 1	Anyone, but coordination with local fisheries biologist reccommended	Projects that restore or enhance habitat for naturally reproducing populations of wild fish.
DNRC RRGL Planning Grant	Pam Smith pamsmith@mt.gov	$300,000 this biennium	$10,000	State	Biannual	Open cycle	Government Entities	Must be for the conservation, management, development, or protection of a renewable resources in Montana. 50% cash match required unless sponsored by a non-revenue producing entity such as a CD
DNRC RRGL Grant	Pam Smith pamsmith@mt.gov	4 million biennial	$100,000	State	Biennual	May 15th even numbered years	Government Entities	Must be for the conservation, management, development, or protection of a renewable resources in Montana.
DNRC RDGP	Greg Mills gmills@mt.gov	4 million biennial	$300,000	State	Biennual	May 15th even numbered years	Government Entities	Projects that reclaim lands damaged by mining; activities that address crucial state needs. Projects must provide benefits in one or more of the following: reclamation, mitigation, and reasearch related to mining and exploration; identification and repair of hazardous waste sites, research to assess existing or potential environmental damage.
DNRC Private Grants	Larry Bloxom lbloxom@mt.gov	$100,000 biennial	$5,000 or 25% of the total estimated project cost	State	Biennual	Open cycle	An individual association, for-profit corporation or non-profit corporation	Projects relating to water where the quantifiable benefits exceed the costs
NRDP - Large Grants	Kathy Coleman kcoleman@mt.gov	6.5 - 8.5 million annually	Not specified	State	Annual	Open cycle	Government Entities, Privates, Non-profits	Projects must restore, replace, or aquire the equivalent of injury natural resources and/or lost services covered in Montana v. ARCO lawsuit
NRDP - Project Development Grants or Small Projects	Kathy Coleman kcoleman@mt.gov	$200,000 annually	$25,000	State	Annual	Open cycle	Government Entities, Privates, Non-profits	Projects must restore, replace, or aquire the equivalent of injury natural resources and/or lost services covered in Montana v. ARCO lawsuit

TABLE 2-1. RESTORATION PLANNING, PROJECTS AND MONITORING FUNDING SOURCES

Agency/Grant Program	Contact	Amount	Limits Per Application	Source	Funding Cycle	Application Due Dates	Who Can Apply	Description
USFWS Fish & Habitat Conservation - Fish Passage	Chris Lowie Chris_Lowie@fws.gov	Nationally 3.6 million in 2005	None although under $50,000 are most attractive	Federal	Annual	Open cycle	Unrestricted	Project funding is for fish passage restoration by removing or bypassing barriers to fish movement such as dam removal, culvert renovation, desinging and installing fishways, installing fish screens, and barrier inventories to identify additional fish passage impediments.
USFWS Partners for Fish & Wildlife Program	Sally Valdes Sally_Valdes@fws.gov	Nationally 16.8 million in 2005	$25,000	Federal	Annual	Open cycle	Some restrictions	This program provides technical and financial assistance to private landowners for habitat restoration on their lands. A variety of habitats can be restored to benefit federal trust species (for example migratory birds and fish and threatened and endangered species).
USFWS Private Stewardship Grants Program	Louise Clemency louise_clemency@fws.gov	Nationally 6.5 million in 2005	Not specified	Federal	Annual	Set by regional offices	Some restrictions	This program provides grants and other assistance to individuals and groups engaged in private, voluntary conservation efforts that benefit species listed or proposed as endangered or threatened under the ESA. Eligible projects include those by landowners and their partners who need technical and financial assistance to improve habitat or implement other activities on private lands.
USFWS Cooperative Endangered Species Conservation Fund (Section 6)	Louise Clemency louise_clemency@fws.gov	Not specified	Not specified	Federal	Annual	Set by regional offices	State governments that have a current cooperative agreement with the Secretary of the Interior	This program funds a wide array of voluntary conservation projects for candidate, proposed, and listed endangered species.
USFWS Cooperative Conservation Initiative	Regional or local office	Not specified	Not specified	Federal	Annual	Set by regional offices	Not specified	Support efforts that restore natural resources and establish or expand wildlife habitat

TABLE 2-1. RESTORATION PLANNING, PROJECTS AND MONITORING FUNDING SOURCES

Agency/Grant Program	Contact	Amount	Limits Per Application	Source	Funding Cycle	Application Due Dates	Who Can Apply	Description
USFWS Fisheries Restoration & Irrigation Mitigation Act (FRIMA)	Morgan McCosh Elmer morgan_elmer @fws.gov	Not specified	Not specified	Federal	Annual	Set by regional offices	Local and state governments, partnerships, and Conservation Districts. Landonwer is often a co-applicant	Design, construction, and installation of fish screens, fish ladders, or other fish passage devices associated with water diversions. Projects may also include modifications to water diversion structures that are required for effective functioning of fish passage devices.
USFWS Dingell-Johnson Sport Fish Restoration	Regional or local office. Website: http://fa.r9.fws.gov	Nationally ~293 million in 2005 & 2006	Not specified	Federal	Annual	Set by regional offices	State fish & wildlife agencies	Support activities designed to restore, conserve, manage, or enhance sport fish populations and the public use benefits from these resources; and to support activities that provide boating access to public waters. Projects supported include fish habitat improvement, reasearch on fishery problems, surveys and inventories of fish populations, provision for public use of fishery resource, and lake and stream rehabilitation.
USFWS Landowner Incentive	Regional or local office. Website: http://international.fws.gov	Nationally 18 million in 2005; 34 million in 2006	Awards range from $165,00 to 1.7 million	Federal	Annual	Set by regional offices	State fish & wildlife agencies	These grants are availabe for conservation efforts to be carried out on private lands, to provide technical or financial assistance to private landowners for the purpose of benefiting Federally listed, proposed or candidate species.
USFWS North American Wetlands Conservation Fund (NAWCA)	Regional or local office. Website: http://birdhabitat.fws.gov/NAWCA/grants.htm	61 million in 2005; 75 million in 2006	Awards range from less than $50,000 to $710,000	Federal	Annual	March, July, and December	Public and private organizations or individuals who have developed partnerships to carry out wetland conservation projects	Funds may be used to restore, manage, and/or enhance wetland ecosystems and other habitat for migratory birds and other fish and wildlife. Lands and waters must have as their primary purpose long-term water conservation for the benefit of migratory birds and other wildlife.
NRCS Environmental Quality Incentives Program	Local USDA Service Center	Not specified - varies from national to state level	Up to $450,000 per project	Federal	Annual	Varies - deadlines set each year	Private landowners that are agricultural producers (can be asssisted by conservation groups, consultants, etc.)	Provides voluntary conservation program for farmers and ranchers that promotes agricultural agricultural production and environmental quality as compatible national goals.

TABLE 2-1. RESTORATION PLANNING, PROJECTS AND MONITORING FUNDING SOURCES

Agency/Grant Program	Contact	Amount	Limits Per Application	Source	Funding Cycle	Application Due Dates	Who Can Apply	Description
NRCS Wildlife Habitat Incentives Program	Local USDA Service Center	Not specified - varies from national to state level	Not specified	Federal	Annual	Varies - deadlines set each year	Private landowners (can be asssisted by conservation groups, consultants, etc.)	Voluntary program for people who want to develop and improve wildlife habitat primarily of private lands. This program provides both technical and cost share assistance to establish and improve fish and wildlife habitat.
FSA Conservation Reserve Program	Local USDA Service Center	Acreage capped program - currently 39.2 million acres nationally	$50,000 annual CRP income per producer	Federal	Annual	Continuous sign up for buffer practices; periodic one-month signups for General CRP	Private landowners that are agricultural producers (can be asssisted by conservation groups, consultants, etc.)	Programs offers annual rental payments, incentive payments, and cost-share for establishment of grasslands, riparian habitat, and wetlands on marginal cropland and pastureland.
NRCS Wetlands Reserve Program	Local USDA Service Center	Not specified - varies from national to state level	Not specified	Federal	Annual	Open cycle	Private landowners (can be asssisted by conservation groups, consultants, etc.)	Voluntary wetland conservation program that offers perpetual easements, 30-year easements, and 10-year restoration cost-share agreements. NRCS holds CEs, private landowner controls access and performs management.
BOR Water Conservation Field Services Program	Area or local Bureau of Reclamation office	$450,000	$25,000	Federal	Annual	June	Unrestricted	Financial assistance for demonstration programs and pilot projects to promote and implement improved water management and conservation. Also for planning, designing, and construction improvements that will conserve water, increase water use effeciency, or enhance water management throught measurement or automation, at existing water supply projects within the 17 western states.
Columbia Basin Water Transaction	Stan Bradshaw Sbradshaw@tu.org	Not specified	Not specified	Private	Not specified	Not specified	Qualified Local Entities (Trout Unlimited)	Improve flows to streams and rivers in the Columbia Basin through water acquisitions, boosting effeciency, conserving habitat, rethinking the source, pools, and banks.

TABLE 2-1. RESTORATION PLANNING, PROJECTS AND MONITORING FUNDING SOURCES

Agency/Grant Program	Contact	Amount	Limits Per Application	Source	Funding Cycle	Application Due Dates	Who Can Apply	Description
Tri-County Resource Advisory Council	Jack deGolia jdegolia@fs.fed.us	Varies - designated by counties each fiscal year. $100,000 was available for the 2005 fiscal year	In 2005, approved project amounts ranged from $1,000 to $16,000	Federal	Annual - The SRSCSDA expires on September 30, 2006. Congress will need to reapprove this Act for funding past this date	Varies - applications are reviewed during RAC meetings	Unrestricted - preference is for projects with several partners	Projects must be located within one of the three counties covered by the Tri-County RAC (Deer Lodge, Granite, or Powell). Funds must be spent on project that benefit federal land, although projects do not have to be located on federal land. Eligible projects include watershed restoration and maintenance; restoration, maintenance, and improvement of wildlife and fish habitat; or reestablishment of native species.

3.0 TOTAL MAXIMUM DAILY LOAD (TMDL)-RELATED RESTORATION PLANNING

As described in Section 1, the restoration Action Plan addresses three restoration programs currently operating within the watershed: the Native Fisheries Management Program; Water Conservation and Drought Management Program; and the TMDL Program. This section of the Action Plan addresses Total Maximum Daily Load (TMDL)-related restoration priorities and opportunities. The TMDL-related restoration program is presented separate from the fisheries-related and water conservation restoration programs due to differences in program strategies, priorities, and potential funding mechanisms. Unlike the other widely evaluated programs (fisheries and drought management), the TMDL program only covers a portion of the impaired streams in the Blackfoot watershed. Although the TMDL listed streams are clearly in need of improvement, the TMDL list as a whole is not considered comprehensive of all water quality impaired streams.

Following is a brief description of the TMDL process and implications for restoration planning, a summary of water bodies within the Blackfoot Watershed identified through the TMDL program as impaired, and potential TMDL-related restoration projects as currently identified. It is the intent that this information, updated yearly to incorporate new TMDL implementation strategies and opportunities, will provide the basis for identification, selection, prioritization, funding, and implementation of future TMDL-related restoration activities.

3.1 THE TMDL PROCESS AND IMPLICATIONS FOR RESTORATION PLANNING

Section 303(d) of the federal Clean Water Act (and related regulations) requires states to assess the condition of surface waters within their borders to identify water bodies that are impaired, or do not fully meet water quality standards. The resulting list of water quality impaired water bodies is known as the 303(d) list. Section 303(d) also requires states to develop water quality improvement plans and strategies, also referred to as TMDLs, for water bodies on their 303(d) list.

In Montana, the Department of Environmental Quality (DEQ) is tasked with development of TMDLs. Montana's approach is to develop TMDLs in the context of comprehensive water quality restoration plans. The goal of a TMDL and water quality restoration plan is to identify sources of water quality impairment, and the level of water quality improvement necessary for a water body to fully support all intended beneficial uses for that water body. Water quality restoration plans typically include a restoration strategy or generalized plan for restoring water quality and associated beneficial uses. In this way, the TMDL program represents an initial step in restoration planning for 303(d)-listed streams.

To encourage water quality restoration efforts in 303(d)-listed streams, various state and federal agencies offer funding in the form of grants and other programs to implement TMDL-identified restoration projects. Therefore, TMDL development is tied to restoration planning

in the Blackfoot Watershed by helping identify restoration needs and priorities, and by providing a potential source of funding for restoration projects.

3.2 TMDL DEVELOPMENT IN THE BLACKFOOT WATERSHED

The Blackfoot Watershed has been divided into four distinct planning areas for purposes of TMDL development (Figure 3-1). The four planning areas include:

- The Blackfoot Headwaters Planning Area, extending from the Blackfoot Headwaters to the confluence with Nevada Creek;
- The Middle Blackfoot, including the Blackfoot River Drainage from Nevada Creek to the confluence with Blanchard Creek;
- The Nevada Creek Planning Area covering the Nevada Creek drainage from its headwaters to the confluence with the Blackfoot River; and
- The Lower Blackfoot Planning area, extending from Blanchard Creek downstream to the confluence with the Clark Fork River.

In 2000, the Montana Department of Environmental Quality approached the Blackfoot Challenge and requested its participation in the development of TMDL plans in the Blackfoot watershed. The Challenge accepted this leadership role since TMDL development fit with their mission and goals for the Blackfoot Watershed, and because locally led efforts will produce a more practicable TMDL plan. TMDL development began in the Headwaters Planning Area in 2001 with development of a Water Quality Restoration Plan and TMDLs for sediment and habitat-related impairments, and a second Water Quality Restoration Plan and TMDLs for metals-related impairment. These documents identified sources of pollution in the 303(d) listed water bodies, as well as conceptual strategies for addressing the identified sources of pollution. TMDL development is currently in progress in the Middle Blackfoot and Nevada Creek Planning areas with TMDL completion scheduled for 2006. TMDL development for the Lower Blackfoot Planning Area is in the initial planning stages with completion scheduled for 2007. As with the Headwaters Water Quality Restoration Plan and TMDLs, the Nevada Creek, Middle and Lower Blackfoot Plans will include restoration strategies to help guide future restoration planning.

3.3 303(d) LISTED WATER BODIES

Since 1996, a total of 56 water bodies (streams, stream segments, river reaches, and lakes) have been identified as impaired on the biannual 303(d) lists (Table 3-1). Since 1996, nine previously listed water bodies have been found to be "Fully Supporting" beneficial uses and are no longer considered to be impaired for TMDL planning purposes. An additional 11 water bodies are included on the list as lacking sufficient credible data (SCD) for determination of impairment conditions at this time. The nine delisted streams and 11 streams lacking SCD are not addressed in this restoration Action Plan. The 11 streams lacking SCD will be incorporated into the Plan if future assessment by MDEQ shows these streams to be impaired. Also, the 20 streams either delisted or lacking SCD may be included under the fisheries or water conservation-related restoration planning portions of this Plan as discussed in subsequent sections. As of March 2005, 36 water bodies are identified as

impaired under the TMDL program. These streams are the focus of the TMDL-related restoration planning in this Action Plan. A history of 303(d) listings for the Blackfoot Watershed dating back to 1996 is included in Table 3-1, and the 2004 303(d) listed streams are shown on Figure 3-1.

Several different causes of water quality impairment are specified in the 2004 303(d) list, with the most common including siltation, habitat alterations and flow alteration. Other less frequently listed causes of impairment include metals, nutrients, thermal modification, and riparian degradation. In TMDL-related restoration planning, the restoration objectives will address the specific listed causes of impairment for the water body. The goal of restoration is to assure that all water quality standards are met and all beneficial uses attained in these streams.

The 36 303(d)-listed water bodies span the Blackfoot Watershed, with the distribution by TMDL planning area as follows:

- Blackfoot Headwaters (7): Two sections of the Blackfoot River and Sandbar Creek, Willow Creek, Beartrap Creek, Poorman Creek, and Arrastra Creek;
- Middle Blackfoot (10): Two sections of the Blackfoot River and Blanchard Creek, Frazier Creek, Kleinschmidt Creek, Monture Creek, Rock Creek, Ward Creek, Warren Creek, and Yourname Creek;
- Nevada Creek (13): Two sections of Douglas Creek, Nevada Creek, and Washington Creek; Lower Jefferson Creek, Black Bear Creek, Braziel Creek, Buffalo Gulch, Cottonwood Creek, Gallagher Creek, and Nevada Spring Creek; and
- Lower Blackfoot (6): Two segments of the Blackfoot River and Elk Creek; Belmont Creek and Union Creek.

3.4 TMDL-RELATED RESTORATION PROJECTS

Appendix B contains a list of ongoing and potential restoration projects on some of the 36 water bodies listed as impaired on the 2004 303(d) list. The primary objective of these projects, as currently defined, is to address the causes of impairment identified on the 303(d) list (as well as other potential causes of impairment) to the point that all intended beneficial uses of the waters are supported, and the streams can ultimately be removed from the 303(d) list. A number of these projects may also meet the restoration objectives and strategies of the fisheries-related or water conservation-related portions of this Action Plan.

The restoration projects listed in Appendix B range from abandoned mine reclamation projects designed to reduce metals loading to streams, to grazing management projects designed to, among other things, improve aquatic habitat and reduce nutrient and sediment loading, to stream reconstruction projects. Most of the projects are preliminary and represent restoration "ideas" and opportunities at this time. Others include restoration strategies outlined in the completed Blackfoot Headwaters TMDLs or projects identified or being developed by partners. These projects must go through initial planning stages, including landowner negotiations and peer review, prior to advancing to the conceptual design and implementation phase. Other projects are in the more advanced stages having already gone

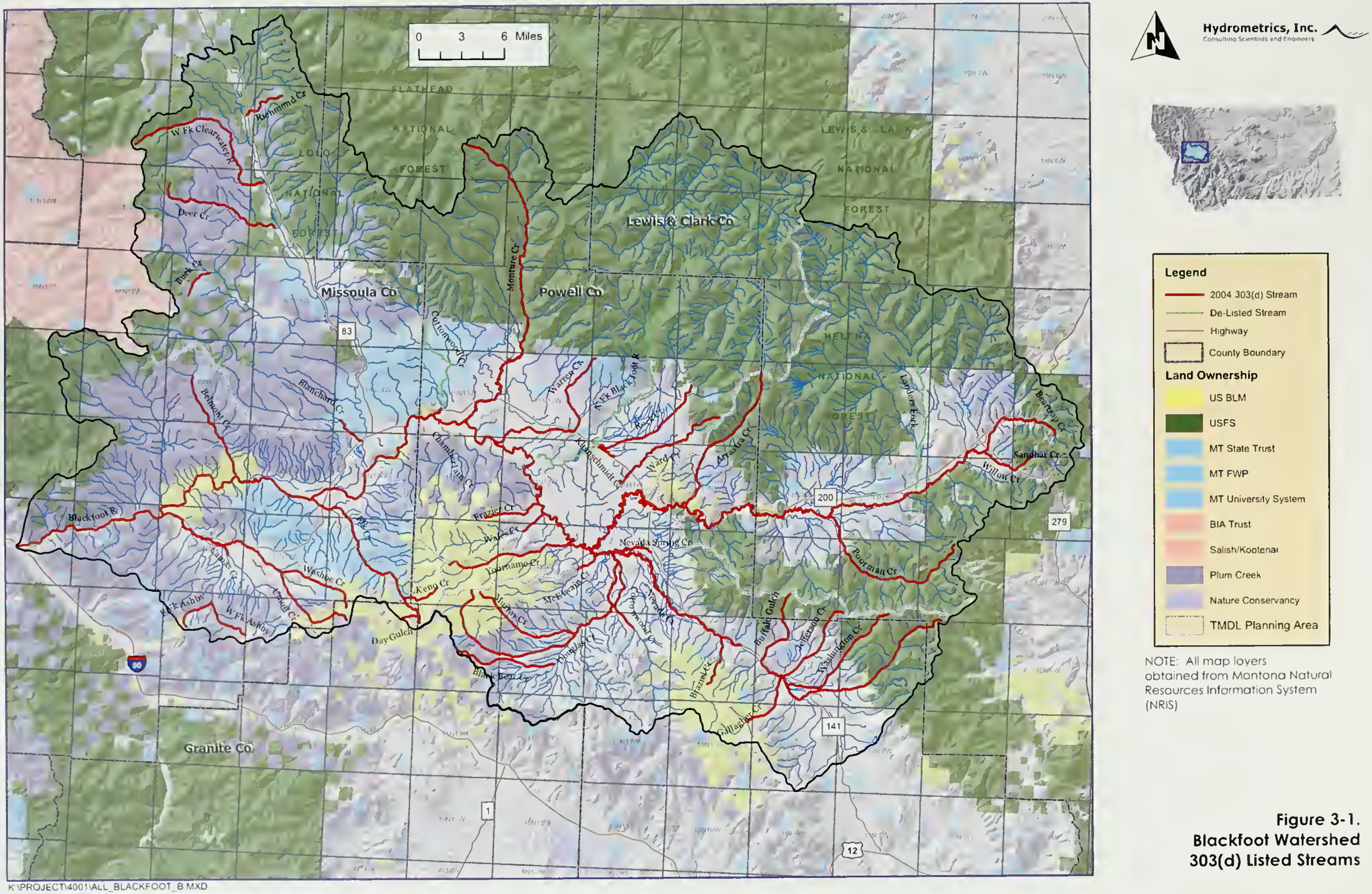
through landowner negotiations and conceptual planning and design, and in some cases are partially funded. These projects are considered to be higher priority for implementation purposes at this time due to their potential for near-term implementation. Projects currently identified as "preliminary," or other potential projects not yet identified, may be elevated to near-term depending on the progress of project planning and landowner negotiations, availability of funding sources, or potential synergies with fisheries or water conservation-related projects. The Action Plan will be updated at least yearly to maintain a list of projects suitable for near-term implementation (within one to two years) should funding or other implementation opportunities arise.

Of the potential projects listed in Appendix B, some are considered to be near-term projects based on the level of planning completed for the project, as well as the severity of impairment conditions and potential benefits associated with the proposed project. The majority of projects fall within the Blackfoot Headwaters, Middle Blackfoot, and Nevada Creek TMDL Planning Areas, since TMDLs have either been completed or are in progress in these areas. Descriptions of these near-term restoration projects on TMDL streams are included in Appendix C. It is assumed that more priority projects will be identified in the Lower Blackfoot Planning Area once TMDL development begins for this portion of the watershed.

In addition to the potential projects identified above as near to mid-term restoration opportunities for the Blackfoot restoration partners, a number of other restoration opportunities and needs are listed in Appendix B. Some of these projects, such as Elk Creek in the Lower Blackfoot Planning Area and Poorman Creek in the Headwaters Planning Area, are very conceptual in nature at this time, with most not yet in the landowner negotiation stage. The projects may develop into near-term restoration projects if future opportunities arise. Other projects, such as mine waste removal from the Blackfoot River floodplain at the Upper Blackfoot Mining Complex, are mandated under other restoration programs and are listed for watershed-wide restoration planning and coordination purposes only.

Appendix B also shows potential or planned projects for certain non-303(d) listed streams. These streams are included since they are tributaries to impaired streams and should be acknowledged as part of the watershed approach to water quality restoration. All of these projects are scheduled for restoration under the fisheries program.

As previously discussed, this list of TMDL-related restoration projects will be updated annually or more frequently if warranted. TMDLs yet to be completed for the Middle Blackfoot, Nevada Creek and the Lower Blackfoot Planning Areas will include restoration strategy sections to help identify specific restoration opportunities and needs for inclusion in future revisions to this Action Plan.



NOTE: All map layers obtained from Montana Natural Resources Information System (NRIS)

Figure 3-1.
Blackfoot Watershed
303(d) Listed Streams

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TABLE 3-1. 303(D) LISTING HISTORY FOR LAKES, STREAMS, AND STREAM SEGMENTS IN THE BLACKFOOT WATERSHED

Listed Water	*Probable Causes (1996 List)*	*Probable Causes (2002 List)*	*Probable Causes (2004 List)*	*Probable Sources (2004 List)*
BLACKFOOT HEADWATERS PLANNING AREA				
Arrastra Creek	Not assessed	Other habitat alterations, Siltation	Other habitat alterations, Siltation	Agriculture, Habitat alteration, Highway maintenance and runoff
Beartrap Creek from Mike Horse Creek to mouth	Metals	Metals	Metals	Resource extraction, Mill tailings
Blackfoot River from Headwaters to Landers Fork	Metals, Other habitat alterations	Metals, Other habitat alterations	Metals, Other habitat alterations	Silviculture, Resource extraction (abandoned mining, acid mine drainage), Habitat modification (other than hydromodification), Bank and shoreline modification/destabilization
Blackfoot River from Landers Fork to Nevada Ck	Other habitat alterations, Siltation	Other habitat alterations, Siltation	Other habitat alterations, Siltation	Agriculture, Silviculture
Poorman Creek	Dewatering, Flow alterations, Metals, Other habitat alterations, Riparian degradation, Siltation	Dewatering, Flow alterations, Metals, Other habitat alterations, Riparian degradation, Siltation	Dewatering, Flow alterations, Metals, Other habitat alterations, Riparian degradation, Siltation	Silviculture (logging road construction/maintenance), Construction, Resource extraction (abandoned mines)
Sandbar Creek	Not assessed	Copper, Metals, Other habitat alterations, pH, Siltation	Copper, Metals, Other habitat alterations, pH, Siltation	Resource extraction (abandoned mining, acid mine drainage), Highway maintenance and runoff
Willow Creek	Bank erosion, Other habitat alterations,	Bank erosion, Other habitat alterations, Siltation	Bank erosion, Other habitat alterations, Siltation	Agriculture (grazing related sources), Habitat alteration (other than hydromodification), Bank and shoreline modification/destabilization, Highway maintenance and runoff
NEVADA CREEK PLANNING AREA				
Black Bear Creek	Siltation, Other Habitat Alterations	Habitat	Habitat	Agriculture, Grazing related sources, Habitat modification-other than hydromodification, Bank or shoreline modification/destabilization
Buffalo Gulch	NOT LISTED	Siltation, Other Habitat Alterations	Siltation, Other Habitat Alterations	Agriculture, Grazing related sources, Silviculture, Logging road construction/maintenance
Braziel Creek	Siltation, Other Habitat Alterations	DID NOT MEET SCD	DID NOT MEET SCD	DID NOT MEET SCD

TABLE 3-1. 303(D) LISTING HISTORY FOR LAKES, STREAMS, AND STREAM SEGMENTS IN THE BLACKFOOT WATERSHED (continued)

Listed Water	*Probable Causes (1996 List)*	*Probable Causes (2002 List)*	*Probable Causes (2004 List)*	*Probable Sources (2004 List)*
Cottonwood Creek	Flow Alteration, Nutrients, Salinity/TDS/Chlorides, Siltation, Thermal Modifications	Flow Alteration	Flow Alteration	Agriculture
Douglas Creek (lower)	Thermal Modifications, Other Habitat Alterations, Siltation, Nutrients, Salinity/TDS/Chlorides, Flow Alteration	Habitat; Thermal modifications	Habitat; Thermal modifications	Agriculture, Grazing related sources, Hydromodification
Douglas Creek (upper)	Thermal Modifications, Other Habitat Alterations, Siltation, Nutrients, Salinity/TDS/Chlorides, Flow Alteration	Habitat; Thermal	Habitat; Thermal modifications	Agriculture, Grazing related sources, Hydromodification
Gallagher Creek	Flow Alteration	Other Habitat Alterations	Other Habitat Alterations	Agriculture, Crop-related sources
Jefferson Creek (lower)	Flow Alteration, Other Habitat Alterations, Siltation	Flow Alteration, Other Habitat Alterations	Flow Alteration, Other Habitat Alterations	Resource extraction, Dredge mining, Agriculture, Grazing related sources, Crop-related sources
Jefferson Creek (upper)	Flow Alteration, Other Habitat Alterations, Siltation	DID NOT MEET SCD	DID NOT MEET SCD	DID NOT MEET SCD
McElwain Creek	Siltation, Flow Alteration, Pathogens	DID NOT MEET SCD	DID NOT MEET SCD	DID NOT MEET SCD
Murray Creek	Flow Alteration, Thermal Modification, Other Habitat Alterations, Siltation	DID NOT MEET SCD	DID NOT MEET SCD	DID NOT MEET SCD
Nevada Creek (headwaters to Nevada Lake)	Flow Alteration, Nutrients, Other Habitat Alterations, Siltation, Thermal Modifications	Metals, Nitrogen, Nutrients, Habitat, Suspended Solids	Metals, Nitrogen, Nutrients, Habitat, Suspended Solids	Agriculture, Grazing related sources, Resource extraction, Placer mining
Nevada Creek (Nevada Lake to Blackfoot River)	Flow Alteration, Nutrients, Other Habitat Alterations, Siltation, Thermal Modifications	Metals, Nitrogen, Suspended Solids, Other Habitat Alterations, Nutrients	Flow Alteration, Siltation, Other Habitat Alterations, Nutrients	Agriculture, Habitat modification-other than hydromodification, Bank or shoreline modification/destabilization

TABLE 3-1. 303(D) LISTING HISTORY FOR LAKES, STREAMS, AND STREAM SEGMENTS IN THE BLACKFOOT WATERSHED (continued)

Listed Water	*Probable Causes (1996 List)*	*Probable Causes (2002 List)*	*Probable Causes (2004 List)*	*Probable Sources (2004 List)*
Nevada Lake	Nutrients, Organic Enrichment/DO, Siltation	DID NOT MEET SCD	DID NOT MEET SCD	DID NOT MEET SCD
Nevada Spring Creek	Siltation, Other Habitat Alterations	Habitat; Siltation	Habitat; Siltation	Agriculture, Grazing related sources, Pasture grazing – riparian, Hydromodification, Flow regulation/modification
Washington Creek (lower)	Flow Alteration, Siltation, Other Habitat Alterations	Flow Alteration, Siltation	Flow Alteration, Siltation	Agriculture, Grazing related sources; Resource extraction; Abandoned mining
Washington Creek (upper)	NOT LISTED	Flow Alteration, Habitat	Flow Alteration, Habitat	Resource extraction, Dredge mining, Abandoned mining
MIDDLE BLACKFOOT PLANNING AREA				
Blackfoot River (Monture Creek to Clearwater River)	Nutrients Siltation	Nutrients; Thermal Mods	Nutrients; Thermal Modification	Agriculture, Silviculture, Flow Regulation/Modification, Hydromodification
Blackfoot River (Nevada Creek to Monture Creek)	Nutrients Siltation	Nutrients; Thermal Mods	Nutrients; Thermal Modification	Agriculture, Crop-related Sources,
Blanchard Creek	Habitat Alterations; Siltation	Habitat alterations; siltation	Other Habitat Alterations, Siltation, Flow Alteration	Agriculture, Grazing related Sources, Hydromodification, Flow Regulation/Modification,, Highway Maintenance and Runoff
Buck Creek	Siltation	DID NOT MEET SCD	DID NOT MEET SCD	DID NOT MEET SCD
Cottonwood Creek	Flow Alteration; Habitat Alterations; Siltation	NONE--FULLY SUPPORTING	NONE--FULLY SUPPORTING	NONE--FULLY SUPPORTING
Chamberlain Creek	Flow Alteration; Habitat Alterations; Susp solids	NONE--FULLY SUPPORTING	NONE--FULLY SUPPORTING	NONE--FULLY SUPPORTING
Deer Creek*	Non-Priority Organics; Siltation	DID NOT MEET SCD	DID NOT MEET SCD	DID NOT MEET SCD
Frazier Creek	Flow Alteration	Habitat Alterations	Other Habitat Alterations	Agriculture, Grazing related sources
Kleinschmidt Creek	NOT PREVIOUSLY LISTED	Copper, fish habitat degradation, metals, other habitat alterations, riparian degradation, thermal modification	Riparian Degradation, Fish Habitat Degradation, Thermal Modifications, Other Habitat Alterations, Arsenic	Agriculture, Grazing related Sources, Hydromodification, Dam Construction, Habitat Modification (other than Hydromodification), Bank or Shoreline Modification/ Destabilization
Monture Creek	Habitat Alterations; Siltation	Habitat Alterations	Habitat Alterations	Agriculture, Grazing Related Sources

TABLE 3-1. 303(D) LISTING HISTORY FOR LAKES, STREAMS, AND STREAM SEGMENTS IN THE BLACKFOOT WATERSHED (continued)

Listed Water	*Probable Causes (1996 List)*	*Probable Causes (2002 List)*	*Probable Causes (2004 List)*	*Probable Sources (2004 List)*
North Fork Blackfoot River	Habitat Alterations; Siltation	NONE--FULLY SUPPORTING	NONE--FULLY SUPPORTING	NONE--FULLY SUPPORTING
Richmond Creek*	Non-Priority Organics; Siltation	DID NOT MEET SCD	DID NOT MEET SCD	DID NOT MEET SCD
Rock Creek	Flow Alteration; Habitat Alterations Siltation	Flow Alteration; Habitat Alterations	Flow Alteration; Habitat Alterations	Agriculture, Flow Reg/Modification, Grazing related Sources, Hydromodification,
Salmon Lake*	Siltation, Nutrients/Organic Enrichment/DO	DID NOT MEET SCD	DID NOT MEET SCD	DID NOT MEET SCD
Seeley Lake	Organic Enrichment/DO	NONE--FULLY SUPPORTING	NONE-FULLY SUPPORTING	NONE--FULLY SUPPORTING
Wales Creek	Flow Alteration; Siltation	DID NOT MEET SCD	DID NOT MEET SCD	DID NOT MEET SCD
Ward Creek	Flow Alteration	Siltation, Other Habitat Alterations	Siltation, Other Habitat Alterations	Agriculture, Silviculture, Highway Maintenance and Runoff, Unpaved Road Runoff
Warren Creek	Flow Alteration	Flow Alteration; Habitat Alterations	Flow Alteration; Habitat Alterations	Agriculture, Crop-related Sources, Grazing related Sources, Hydromodification, Channelization
West Fork Clearwater River*	Non-Priority Organics; Siltation	DID NOT MEET SCD	DID NOT MEET SCD	DID NOT MEET SCD
Yourname Creek	Flow Alteration	Flow Alteration	Flow Alteration	Agriculture
LOWER BLACKFOOT PLANNING AREA				
Belmont Creek	Other Habitat Alterations, Siltation	Siltation	Siltation	Agriculture, Grazing-related Sources, Silviculture, Logging Road Construction/Maintenance
Blackfoot River (Belmont Cr to mouth)		Metals, Total Toxics	Unionized Ammonia	Source Unknown
Blackfoot River (Monture Cr to Belmont Cr)	Nutrients, Siltation (segments combined in 1996 303(d) list)	Nutrients, Thermal Modifications	Nutrients, Thermal Modifications	Agriculture, Silviculture, Hydromodification, Flow Regulation/Modification
Camas Creek	Flow Alteration, Siltation, Thermal Modifications	Uses Assessed are Fully Supported; Other Uses Not Assessed	Uses Assessed are Fully Supported; Other Uses Not Assessed	Agriculture, Highway/Road/Bridge Construction, Irrigated Crop Production, Natural Sources, Range Land, Streambank Modification/ Destabilization

TABLE 3-1. 303(D) LISTING HISTORY FOR LAKES, STREAMS, AND STREAM SEGMENTS IN THE BLACKFOOT WATERSHED (continued)

Listed Water	*Probable Causes (1996 List)*	*Probable Causes (2002 List)*	*Probable Causes (2004 List)*	*Probable Sources (2004 List)*
Day Gulch	Flow Alteration, Other Habitat Alterations, Siltation	Insufficient Data To Assess Any Use	Insufficient Data To Assess Any Use	Placer Mining
East Fork Ashby Creek	Siltation	Uses Assessed are Fully Supported; Other Uses Not Assessed	Uses Assessed are Fully Supported; Other Uses Not Assessed	Agriculture, Highway/Road/Bridge Construction, Range Land, Silviculture
Elk Creek (headwaters to Stinkwater Cr)	Flow Alteration, Siltation (segments combined in 1996 303(d) list)	Cadmium, Metals, Nitrate, Nutrients, Other Habitat Alterations, Siltation	Cadmium, Metals, Nitrate, Nutrients, Other Habitat Alterations, Siltation	Silviculture, Logging Road Construction/Maintenance, Resource Extraction, Placer Mining
Elk Creek (Stinkwater Cr to mouth)		Other Habitat Alterations, Siltation, Thermal Modifications	Other Habitat Alterations, Siltation, Thermal Modifications	Agriculture, Grazing-related Sources
Keno Creek	Flow Alteration, Other Habitat Alterations, Siltation, Thermal Modifications	Uses Assessed are Fully Supported; Other Uses Not Assessed	Uses Assessed are Fully Supported; Other Uses Not Assessed	Harvesting, Restoration, Residue Management, Logging Road Construction/Maintenance, Silviculture
Union Creek	Flow Alteration, Other Habitat Alterations, Siltation, Thermal Modifications	Arsenic, Copper, Metals, Nutrients, Other Habitat Alterations, Phosphorus, Suspended Solids, Thermal Modifications	Arsenic, Copper, Metals, Nutrients, Other Habitat Alterations, Phosphorus, Suspended Solids, Thermal Modifications	Agriculture, Grazing-related Sources, Intensive Animal Feeding Operations, Resource Extraction, Abandoned Mining, Hydromodification, Flow Regulation/Modification
Washoe Creek	Flow Alteration, Other Habitat Alterations, Siltation	Uses Assessed are Fully Supported; Other Uses Not Assessed	Uses Assessed are Fully Supported; Other Uses Not Assessed	Resource Extraction, Subsurface Mining, Surface Mining
West Fork Ashby Creek	Other Habitat Alterations, Siltation	Uses Assessed are Fully Supported; Other Uses Not Assessed	Uses Assessed are Fully Supported; Other Uses Not Assessed	Logging Road Construction/Maintenance, Resource Extraction

* These streams have been found to be fully supporting beneficial uses by MDEQ after publication of the 2004 303(d) list

4.0 FISHERIES RESTORATION PLANNING

The Blackfoot River watershed possesses a variety of wild trout, as well as cool-and warm-water fishes. Within the watershed, fish communities and distribution of individual species is longitudinal, a pattern in which species richness increases in the downstream direction and with increasing stream size. In contrast to this general distribution, *imperiled native fish* (bull trout and fluvial westslope cutthroat trout) occupy large areas of the watershed. These fish spawn often in discrete areas and rear in small streams high in the watershed before moving down to the larger, more productive streams where they grow to maturity. These broad areas of native fish use overlap at the low elevations with over 20 other species, including important non-native sport fish such as rainbow trout and brown trout.

With few exceptions, the life histories of wild trout of the Blackfoot River involve tributaries. Based on these mainstem/tributary relationships, community richness and population densities of fishes in the mainstem Blackfoot River closely reflect the number and quality of nearby tributaries. Because habitat degradation is extensive in tributaries, restoration of tributaries has become the primary method of restoring river populations. Biotic relationships between the Blackfoot River and tributary system also vary by river reach. Some reaches of the Blackfoot River posses few (functional) tributaries and/or support a harsh natural environment. Native fish and the subtle adaptations they possess (including whirling disease resistance) make them well-suited to the environmental extremes of the Blackfoot watershed. As such, native fish appear to provide much of the potential to improve currently suppressed river populations. With an emphasis on improving tributary conditions, native trout of Blackfoot River have shown consistent population size increases since the advent of the native fish recovery efforts in 1990.

Since hatchery stocking of rainbow trout ceased in 1979, Montana Fish, Wildlife and Parks (MFWP) has managed stream-dwelling salmonids of the Blackfoot River under the *wild trout* philosophy – a management philosophy that relies upon natural reproduction of wild fish. Attaining *quality habitat* and stream connectivity provide the basis of this management philosophy. Quality stream habitat is defined as a stream possessing water of sufficient quantity and quality where an arrangement of physical channel features provides food, cover (security) and space in an environment that allows a population to thrive. Stream connectivity provides the mechanism for fish to move among streams or stream reaches and to complete their life cycle and use a variety of habitats. When attempting to correct fisheries-impairment on streams, properly identifying and correcting habitat-related *limiting factors* is essential to successfully restoring stream-dwelling wild trout. Limiting factors are defined as any factor that inhibits or limits the population below its full potential. This concept of managing for wild trout, focusing on native fish, restoring and connecting habitats, and correcting other human-induced limiting factors forms the general foundation of the Blackfoot River fisheries restoration initiative.

4.1 RESTORATION CONCEPTS

Fisheries restoration planning, at a basic level, involves the biogeography of fishes, an understanding of fisheries (i.e., habitat) impairment and the role that stakeholders (e.g.

private landowners and the angling public) play in restoration outcomes. At a secondary level, the methods and outcomes of restoration must further consider 1) stream potential, 2) the relationships of project scale (i.e., stream-reach, stream and watershed) to the problem, 3) a recognition of tradeoffs, 4) indirect and/or downstream benefits of restoration actions, and 5) uncertainty (i.e., risk) of restoration outcomes.

Reducing uncertainty of outcomes, above all, requires firm commitment of cooperating parties to success. Generating sufficient project information on which to base restoration decisions is also essential. Project information involves recognizing not only the sources of impairment, but also reasonable assessments of biological/fisheries outcomes. Obtaining this information usually involves: 1) establishing a thorough pre-project (habitat and fish populations) baseline; 2) understanding life-history, habitat associations and limiting factors related to target and, in some cases, non-target species; 3) identifying clear and attainable goals and objectives; 4) developing realistic time-frames necessary for project and species recovery; 5) recognizing an ability to correct up-and downstream limiting factors; and 6) developing post-project monitoring protocols through recovery phases to ensure the projects meet their objectives. Restoration practices must also conform to the 'trust' responsibilities of several local, state and federal natural resource and permitting agencies. A willingness to modify restoration methods based on monitoring results is important. Considerations of off-site concerns are often important to restoration outcomes and may involve downstream beneficial uses including improved water quality and quantity, and/or recruitment of recreational species to the Blackfoot River. Less predictable outcomes may result from the influences of exotic fishes, diseases and perhaps climate change on some projects.

As a final outcome, restoration projects must be consistent with ecologically sound and sustainable practices, contribute to conservation of high quality aquatic habitat and protect native aquatic species. Several restoration-related plans can help guide restoration practices and the recovery of native fishes, including:

- *Restoration Plan for Bull Trout in the Clark Fork River Basin and Kootenai River Basin Montana* (MBTRT 2000);
- *Draft Recovery Plan for the Bull Trout and Proposed Critical Habitat* (USFWS 2002);
- *A Hierarchical Strategy for Prioritizing the Restoration of 83 Impaired Tributaries of the Big Blackfoot River* (Pierce et al 2002b);
- *Westslope Cutthroat Trout Status Review* (Shepard et al. 2003); and
- *Region 2 Native Salmonid Management Guidelines*, Montana Fish, Wildlife and Parks, Missoula

Several additional research projects and FWP restoration-related studies completed in the Blackfoot River watershed (Appendix A and Appendix G) also provide relevant information. The intent of these plans has been integrated into the framework of this strategy.

4.2 FISHES OF THE BLACKFOOT WATERSHED

There are currently 12 native fish species and 13 non-native fish species in the Blackfoot Watershed, as well as several hybrid salmonids. Native species of the Blackfoot Watershed are bull trout (*Salvelinus confluentus*), westslope cutthroat trout (*Oncorhynchus clarki lewisi*), mountain whitefish (*Prosopium williamsoni*), pigmy whitefish (*P. coulteri*), longnose sucker (*Catostomus catostomus*), largescale sucker (*C. macrocheilus*), northern pikeminnow (*Ptychocheilus oregonensis*), peamouth (*Mylocheilus caurinus*), redside shiner (*Richardsonius balteatus*), longnose dace (*Rhinichthys cataractae*) slimy sculpin (*Cottus cognatus*) and mottled sculpin (*C. bairdi*). Non-native species include rainbow trout (*O. mykiss*), kokanee (*O. nerka*), Yellowstone cutthroat trout (*O. clarki bouvieri*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), arctic grayling (*Thymallus arcticus*), white sucker (*C. commersoni*), fathead minnow (*Pimephales pomelas*), northern pike (*Esox lucius*), brook stickleback (*Culaea inconstans*), pumpkinseed (*Lepomis gibbosus*), largemouth bass (*Micropterus salmoides*) and yellow perch (*Perca flavescens).*

Compared to other families of fishes, stream-dwelling salmonids of the Blackfoot River receive management emphasis. Emphasis on salmonids relates to their 'sensitive' status and popular sport fisheries value. As a family of fishes, salmonids (and native trout specifically) can also be compared to the "canary in the coal mine," meaning they are very sensitive to changes in water quality, especially increases in sediment and water temperature. As indicators of cold and clean water, measures to restore natural conditions suitable to salmonids also provide benefits to sympatric species (non-salmonids) that require natural environments but receive less management emphasis.

Most salmonids in the Blackfoot River (rainbow trout, brown trout, westslope cutthroat trout, bull trout and mountain whitefish) exhibit *fluvial* (or migratory) life-histories, whereas tributaries support both *migratory* and *stream-resident* populations. Migratory fish are hatched in tributaries where they rear before migrating to a river where they grow to maturity before returning to natal tributaries to spawn. Migratory fish require connectivity. Stream resident fish exhibit less movement and spent their entire life in small streams. Enhancing or maintaining migratory forms are desirable because more and variable habitats are needed, thus allowing more fish in a population and greater resistance and resilience to stochastic events. Connectivity and migratory forms also increase the likelihood for, and provide a source of, naturally refounding extirpated populations. This increases the probability of long-term species survival.

4.2.1 Nonnative Salmonids of the Blackfoot Watershed

Several introduced fishes (brown trout, rainbow trout and brook trout) of the Blackfoot River are managed as sport fisheries and offer harvest opportunities.

Brown trout

European brown trout, introduced to North America in the 1880s, include a diversity of life-history forms. The mixing of various European stocks brought the basis of genetic diversity and potential for rapid naturalization of self-sustaining populations of brown trout across the

continent. Brown trout rapidly became established and quickly replaced native trout in large rivers of the West. Brown trout now support popular sport fisheries in many rivers including the Blackfoot River. In the Blackfoot watershed, brown trout tend to dominate medium-sized, low-elevation tributaries that provide undercut banks and abundant cover. Brown trout co-exist with other salmonids in the larger river reaches where sufficient habitat complexity creates a diversity of niches. Brown trout inhabit ~15% of the perennial stream system with a distribution that extends from the Landers Fork down the length of the Blackfoot River and into the lower foothills of the tributary system tributaries (*see* distribution map on Figure 4-1). As a species, European brown trout co-evolved with the parasite *myxobolus cerebralis* and possess a higher level of natural resistant to whirling disease than other salmonids.

Rainbow trout

Rainbow trout, a renowned sportfish, has been introduced into cold-water habitats worldwide. In western Montana, rainbow trout were brought inland from coastal and other areas of western North America beginning in the late 1800s. Since the implementation of wild trout management, the distribution of rainbow trout in the Blackfoot watershed has diminished, with the species no longer present in the upper Blackfoot River. Stream-dwelling rainbow trout currently inhabit the lower mainstem Blackfoot River and reproduce in the lower portions of the larger tributaries. Rainbow trout occupy ~10-15% of the perennial streams at the lower elevation of the Blackfoot watershed (*see* distribution map on Figure 4-1). They dominate the lower river reaches but also are also established in lakes, reservoirs and private ponds. Rainbow trout are highly susceptible to whirling disease, which is expanding within the range of stream-dwelling rainbow trout in the Blackfoot Watershed. This escalation of whirling disease corresponds with a trend of declining densities for wild rainbow trout in the mainstem Blackfoot River.

Brook trout

Brook trout, like all charr in the genus *Salvelinus* (including bull trout), are known for its adaptation to cold water. But unlike other charr, brook trout are also tolerant of warmer waters. Unlike bull trout, brook trout are also more tolerant of higher sediment levels and are thus better able to reproduce in streams of impaired condition. Brook trout were brought to the inland American West from northeastern North America for sportfishing and subsistence between 1920 and 1950. Brook trout have vastly increased their distribution and abundance and now pose a threat to native cutthroat trout and bull trout and have replaced populations of both species in certain waters. Resident brook trout are widely distributed in tributaries of the Blackfoot Watershed, but are rare in the mainstem Blackfoot River below the Landers Fork tributaries (*see* distribution map on Figure 4-1). Brook trout are considered vulnerable to whirling disease.

4.3 NATIVE TROUT OF THE BLACKFOOT RIVER: INTRODUCTION, MANAGEMENT, AND RECOVERY GUIDLINES

4.3.1 Bull Trout Recovery Areas – Core Areas and Proposed Critical Habitat

Bull trout is a Montana *species of special concern* and *threatened* under the Endangered Species Act. The recovery of bull trout is a fisheries priority under both State FWP and Federal USFWS programs in the Blackfoot Watershed. Bull trout inhabit ~125 miles of the Blackfoot River main stem. Bull trout are especially vulnerable to increased water temperatures and sediment loads, changes in flow regimes, blocked migration routes and non-native trout like brook trout. Densities of bull trout are very low in the upper Blackfoot River, but increase downstream of the North Fork at river mile 54. Outside of the Clearwater River drainage, bull trout occupy ~25% of the drainage or ~355 miles of stream (*see* distribution map on Figure 4-1). Most bull trout spawning streams (Gold Creek, Dunham Creek, Monture Creek, Copper Creek, and the North Fork of the Blackfoot River) support fluvial fish, although some streams (Poorman, Cottonwood and Belmont Creeks) seem to support predominately resident bull trout. Adult migratory bull trout distribution is generally tied to the larger, colder streams north of the Blackfoot River and larger, more productive river reaches. Fluvial bull trout reproduce in only a few discrete groundwater-fed spawning sites and seek cold-water refugia during periods when the river is warm (>60 °F). Juvenile bull trout also seek small and cold, non-spawning tributaries, some of which are located in the Garnet Mountains presumably for cold water refugia, foraging and predator avoidance.

Bull trout recovery focuses on primarily *core area* watershed and *proposed critical habitat* (Figure 4-2) (MBTRT, 2000; USFWS, 2002, Appendix G). To assist with bull trout recovery in the Blackfoot Watershed, the Montana Bull Trout Recovery Plan (MBTRT, 2000) established the following recovery goals: 1) maintain self-reproducing migratory fish in the Blackfoot River with access to tributary streams and spawning in all *core area* watersheds; 2) maintain the population genetic structure throughout the watershed; 3) maintain and increase the connectivity between the Blackfoot River and its tributaries; 4) establish a baseline of redd counts in all drainages that presently support spawning migratory bull trout; and 5) maintain a count of a least 100 redds or 2,000 individuals in the Blackfoot drainage with an increasing trend thereafter (MBTRT, 2000). In 2002, the USFWS designated *proposed critical habitat* and developed a draft recovery plan. The proposed critical habitat designation included the mainstem Blackfoot River and all mainstem tributaries of all core area watersheds. The draft recovery plan outlined measures needed to help remove bull trout from the ESA list, similar to the Montana Bull Trout Recovery Team (USFWS, 2002).

In addition to State and Federal recovery plans, several research and restoration-related reports further contribute to bull trout recovery planning in the Blackfoot River Watershed (Appendix G). These plans generally outline: 1) the relationships of bull trout to *clean, cold, connected* and *complex* habitats; 2) life-history relationships with spawning and non-spawning tributaries and river reaches; and 3) ecological risks related to adverse land use practices, as well as interactions of non-native fishes. For restoration activities in bull trout habitat, recovery plans should be considered on a stream specific basis, in conjunction with pertinent recovery plans, and in consultation with FWP or other qualified agency biologists during initial project planning phases.

4.3.2 Bull Trout Recovery - Recreational Conflict Areas

Based on fisheries management-related risks to bull trout recovery, FWP recently identified *bull trout recovery - recreational conflict areas* (Figure 4-3). These *conflict areas* refer to biologically critical sites (key spawning, rearing and staging areas, important migration corridors and areas of thermal refugia) that overlap with recreational developments, areas of increased angler pressure and where illegal bull trout harvest is a concern. Concern over *conflict areas* also relate to: 1) large increases in angling pressure in bull trout recovery areas; 2) the documented inability of most anglers to identify bull trout; 3) continued illegal harvest of bull trout; and 4) expanded recreational developments in critical recovery areas. Recent declines in adult bull trout densities and population size compound these concerns. Integrating recreational conflict areas into this action plan would lead to a more programmatic and conservation-based management philosophy by resource management agencies. Additional special fishing regulations may also be necessary to protect native salmonids in these areas.

4.3.3 Westslope Cutthroat Trout (WSCT)

Westslope cutthroat trout, a *species of special concern* in Montana, has declined over much of their historic range within the last century. These declines are more pronounced in the Missouri River drainage than the upper Columbia River drainages (Shepard et al., 2003). Reasons for the decline include habitat loss and degradation, genetic introgression with introduced rainbow trout and Yellowstone cutthroat trout, over-harvest, and competition with introduced brook trout and brown trout. In the Blackfoot Watershed, WSCT occupy ~93% of historical range, compared with ~39% of occupied historical range statewide. The Blackfoot River also supports one of the larger fluvial meta-populations of WSCT (upper drainage) in Montana, but at population abundance well below habitat capacity (Shepard et al., 2003, Appendix G).

The Blackfoot River watershed (outside of the Clearwater Drainage) supports a nearly basin-wide distribution of WSCT with 86% (85 of 98) of surveyed fish-bearing tributaries containing WSCT (Figure 4-1). Streams lacking WSCT are either impaired headwater streams or degraded spring creeks. The densities of WSCT usually decrease in the downstream direction. These longitudinal decreases typically relate to adverse habitat changes, losses to irrigation ditches, barriers to movement, natural dewatering and the interactions with non-native fishes.

WSCT stocks include migratory (fluvial) and stream resident fish. Fluvial fish have a sympatric resident component. Both stream resident and fluvial WSCT rely on high quality tributary habitats for spawning, rearing and over-wintering. Stream resident fish can also maintain populations in isolation, occupying less than one mile of perennial stream in some cases. Stream connectivity and access to the Blackfoot River is also necessary for fluvial fish to complete their life-cycle. Fluvial WSCT spend early life stages in smaller streams and migrate to the river to mature where they grow too much larger size than resident fish, before returning to natal tributaries to spawn.

WSCT genetic tests in the Blackfoot Watershed show a high degree of genetic 'purity' over large areas, particularly in the upper watershed upstream of the confluence of the North Fork (Figure 4-4). Within this setting, a primary conservation strategy identified in the upper Blackfoot Watershed involves managing for metapopulation function and multiple life-history strategies (Shepard et al. 2003). This conservation strategy involves managing both stream resident and fluvial WSCT. Managing metapopulations of fluvial fish not only involves maintaining main stem connectivity of the Blackfoot River with spawning areas, but also: 1) reducing or eliminating *controllable* sources of anthropogenic mortality; 2) maintaining and restoring existing spawning and rearing habitats; and 3) managing lakes and private fish ponds with appropriate species. Although stream connectivity allows spawning migrations, season movements and complex life history strategies to persist, WSCT restoration strategies must also consider genetic integrity as well as other ecological risks such as invasive species and diseases when considering restoring connectivity to isolated populations. Conservative strategies should also entail maintaining an array of existing isolated populations of genetically 'pure' WSCT as a measure against known and unknown ecological risks.

Ecological risks to WSCT conservation are generally complex and should be considered on a stream or reach specific basis. From a restoration perspective, planning should consider life-history expression, habitat capacity and availability, genetic composition, risks related to land use, potential interactions of non-native species (e.g. brook trout and rainbow trout), as well as public expectations of recruitment to recreational fisheries. As with bull trout, the range of biological interactions and concerns for WSCT should be established in consultation with State agency fisheries biologist during the initial restoration planning process. This particularly applies where barriers, genetically pure isolet populations and potential for invasive species are involved.

4.3.4 Native Species Management Areas

Native species management areas are general FWP designations representing a regional (R-2) approach to native fish management in the Clark Fork watershed. In the Blackfoot sub-basin, the classification contains two major categories: 1) native species conservation areas; and 2) native species maintenance areas (Figure 4-5). Within each category, the following management implications are considered: 1) stocking and transplant policy; 2) fishing regulations; 3) watershed restoration activities; 4) land acquisitions by other agencies or conservation groups; 5) stream alterations and fish ponds; and 6) fishing access.

4.3.5 Native Species Conservation Areas

In most cases, these are bull trout critical habitat and areas close in proximity to the headwaters, including spawning areas for fluvial fish. Conservation areas include: 1) streams that support native species, 2) a stable detectable bull trout population, 3) areas that tend to have genetically pure WSCT populations, or 4) if genetic composition can be improved by management. Conservation areas are critical to the long-term persistence of native species. Where native species will be the management emphasis, suppression or

removal of introduced species will be considered to maintain populations in conservation areas. Guidelines and management strategies include:

1. Stocking of non-native species will not occur. The impacts of stocking on amphibians, reptiles and invertebrates if detrimental to native populations will be considered;
2. Fishing regulations will be tailored to encourage native species and discourage introduced species;
3. These areas would be the highest priority for watershed restoration activities
4. These areas would be a priority for land acquisition and protection (i.e., easements) by federal and state agencies;
5. Stream alteration permitting would strongly encourage the use of native material and natural stream function;
6. Fish species and strains permitted in private fishponds will only include those that are genetically compatible with the populations in source and receiving waters; and
7. The biological consequences of additional fishing access sites on native populations would be heavily considered.

4.3.6 Native Species Maintenance Areas

Maintenance areas of the main stem have retained populations of fluvial WSCT or bull trout, but are predominately composed of non-native species (salmonids). Maintenance areas are also low elevation tributaries dominated by non-natives with only relic populations of native trout. These are areas where native species will be the management emphasis, but no active effort will be taken to remove or discourage introduced species. Guidelines and management strategies include:

1. Stocking of introduced species may occur if compatible with existing populations;
2. Fishing regulations will encourage native species. They will not necessarily discourage introduced species;
3. These areas are high priority for watershed restoration activities;
4. Land acquisition would be encouraged, but not as high a priority as native species conservation areas;
5. Non-native will be stocked in ponds if already present in the wild. Normal precautions will be taken to keep fish stocked in private ponds from contacting wild populations; and
6. Fishing access would be prioritized based on angling opportunity and social need.

4.4 GENERAL FISHERIES HEALTH

4.4.1 Fisheries Impairments of the Blackfoot River

The mainstem Blackfoot River is one of the most diverse and biologically complex rivers in western Montana. Unfortunately, large sections of the river support low densities of trout due to an array of natural and human-related factors. The natural complexity and limitations of the mainstem involve severe icing of the channel, low stream flows and drought prone

areas, fine sediment accumulation and areas of limited secondary productivity. Human influences involve metals contamination, dewatering, barriers to movement (e.g. Milltown dam and many sub-standard road crossings) and areas of impaired water quality and extensive alteration of the tributary system and essential habitat components it provides. Functional tributaries play essential roles in the life stages (migration, spawning and rearing) of all fluvial Blackfoot River fish. Altered and degraded tributaries generally inhibit movement and reduce spawning and rearing success, which contributes to suppressed populations and inadequate recruitment of multiple species over large areas of the river. The sum of these natural and human variables produces a diverse array of wild fish communities that vary in species composition and overall population densities among river reaches. Because of this variability, we consider mainstem on a reach-by-reach basis. Each reach has its own set of natural problems and human-induced limiting factors that need to be addressed if populations are to substantially improve.

Reach 1: Headwaters to Lincoln. This reach has been evaluated since the 1970's, both before and after the collapse of the Mike Horse mine tailings dam. This ecological disaster sent contaminated mine tailings into the upper mainstem Blackfoot River. The acute and chronic effects of this contamination coincide with the collapse of WSCT in headwater areas. The tailings were partially contained by a series of wetlands, preventing more serious contamination of the lower Blackfoot River. During the 1990s, a voluntary reclamation of patented mining claims was undertaken on ASARCO properties. Cleanup plans on the Helena National Forest are being developed.

Below this area of contamination, the Blackfoot River supports WSCT, brown trout, brook trout and bull trout in low densities. In addition to mining contamination in the headwater, this reach lacks complexity in portions of the mainstem, naturally becomes dewatered downstream of Landers Fork and has localized tributary problems. Natural gas exploration is now occurring in tributaries of this reach. A low level infection of whirling disease is also present in this reach.

FWP fish surveys in the early 1970s, before the collapse of the tailing dam, showed healthy WSCT numbers in the upper mainstem. After the dam collapse, cutthroat numbers declined drastically. And the impacts of contamination linger today. In one sampling section (Pop's Place section) the point estimate for age 1+ WSCT declined from 101fish/1,000' in 1971 to zero in 1999. In a downstream monitoring section (Flescher Pass section) age 1+ WSCT densities have declined approximately 75%. The percent trout species composition for Flescher Pass section for 1999 is located in Figure 4-6.

Reach 2: Lincoln to Arrastra Creek. The upper portion of this alluvial reach gains most of its base flow from groundwater and spring creeks. Water quality and complexity improve substantially compared to the upper reach. Mainstem brown trout spawning is concentrated in the upper portion of this reach and in the spring creeks near Lincoln. Several tributaries enter the river, the majority of which have been identified with some level of fisheries impairment. Several tributaries are at various stages of restoration. Fish populations consist primarily of resident brown trout, fluvial WSCT in low, but increasing, densities and very low densities of fluvial bull trout. Telemetry studies indicate several tributaries in this reach

and upstream of Lincoln provide native fish recruitment. Copper Creek is the primary fluvial bull trout spawning site. Recent whirling disease monitoring reveals a gradual increase in infection level in this section of the Blackfoot River. When last surveyed in 1999, total trout densities (fish >6.0") in the Canyon Section of reach 2 were 55 fish/1000'. The percent trout species composition for this survey is located in Figure 4-6.

Reach 3: Arrastra Creek to Nevada Creek. This reach of river is low gradient, highly sinuous and subject to 1) active stream bank erosion, 2) deposition of fine sediment, and 3) winter anchor ice formation beginning in the lower portion of this reach and extending down the remaining length of the Blackfoot River. Fine sediment limits instream production of food organisms. Although limited, mainstem brown trout spawning has been observed. Juvenile surveys indicate very low recruitment. There are no tributaries entering this reach of river, which further limits recruitment. Irrigation reduces instream flows resulting in late-summer and early-fall low flow conditions. Evaluation of irrigation ditch entrainment is ongoing. Initial ditch evaluations indicate juvenile entrainment in some ditches, further hindering recruitment. Although a population survey section does not exist in this reach, other fisheries investigations suggest low densities in the upper portion of this reach, decreasing to very low in the downstream portion of this reach.

Reach 4: Nevada Creek to the North Fork. In this reach, channel gradient increases and the river becomes laterally confined by glacial moraine. This reach is subject to chronic water quality problems originating from Nevada Creek, which enters at the upper boundary of this reach. This reach exhibits elevated nutrients levels, low summer flows, high summer water temperatures, anchor-ice formation in the winter and high levels of fine sediment in substrates. All tributaries entering this reach are fisheries impaired due largely to irrigation and riparian degradation. Tributaries support salmonids in the headwaters but not in lower reaches. Poor recruitment limits river salmonid populations and fish densities are very low for all species. These combined influences result in the lowest population densities for the mainstem Blackfoot River downstream of Lincoln. Fish population survey completed in 2004 recorded total trout densities (fish >6.0") in the Wales Creek Section of reach 4 at 9 fish/1000'. The percent trout species composition for this survey is located in Figure 4-6.

Reach 5: North Fork to the Clearwater River. The North Fork Blackfoot River approximately doubles the base flow of the Blackfoot River, bringing a much-needed influx of cold water to the main stem during summer. The influx of groundwater to the lower North Fork during base flow periods may also moderate severe winter conditions in a portion of the mainstem below the North Fork mouth. Below this junction, population densities of all salmonids increase due to the improved mainstem conditions and increased recruitment from more functional tributaries. Many tributaries of this reach are the focus of ongoing restoration practices. In this river section, bull trout densities increase due to recruitment from the two largest tributaries (Monture Creek and the North Fork) of this reach, angler restrictions and restoration. Likewise, WSCT have improved with densities increasing. Brown and rainbow trout are common throughout this reach and the lower portions of most tributaries. Unfortunately, whirling disease has recently escalated to lethal levels in most rainbow trout spawning and rearing sites within this reach. This disease escalation coincides with the declining trend in rainbow trout densities in recent years. Fish population survey

completed in 2004 recorded total trout densities (fish >6.0") in the Scotty Brown Bridge Section of reach 5 were 49 fish/1000'. The percent trout species composition for this survey is located in Figure 4-6.

Reach 6: Clearwater River to the mouth. Downstream of the Clearwater River mouth, the Blackfoot River becomes laterally contained over the remainder of its length by bouldery terraces and steep canyon walls. Milltown Dam, located at the mouth of the Blackfoot River has blocked the upstream movement of all species since 1907. Several tributaries enter this reach and those to the north originate primarily from industrial forestlands. Southern tributaries flow from mountains through primarily agricultural foothills before entering the mainstem. With few exceptions, the lower reaches of all southern tributaries are severely impaired. Conversely, streams to the north appear to support the majority of Blackfoot River fish spawning. With increased recruitment of primarily rainbow trout, Blackfoot River fish populations increase substantially in the downriver direction. Unfortunately, like reach 5, rainbow trout are declining. Whirling disease is present near lethal levels in the mainstem but currently at sub-lethal levels in primary rainbow trout spawning streams. Brown trout and WSCT are stable to increasing in this river reach. Bull trout, originating primarily in the Monture and North Fork Watersheds have declined to very low densities. Fish population surveys completed in 2004 recorded total trout densities (fish >6.0") in the Johnsrud Section of reach 6 were 128 fish/1000'. The percent trout species composition for this survey is located in Figure 4-6.

4.4.2 Tributary Impairments

Within the Blackfoot Watershed, the great majority of inventoried streams exhibit some level of physical and biological impairment (Table 4-1). The level of impairment varies significantly within and among streams. The concentration and diversity of tributary fisheries problems also increases longitudinally, with the most serious problems found in lower stream reaches on private land. However, significant impairment occurs on State and Federal lands as well. Fisheries impairments result from a wide array of land use practices, such as mining pollution, excessive riparian timber harvest, riparian grazing management, poorly designed roads, non-point agricultural runoff, stream dewatering, channel alterations, fish losses to irrigation ditches and artificial barriers to fish movements, etc. These impairments have diminished fisheries resources, and in some cases, have led to the loss of salmonids from entire stream reaches. In general, correcting habitat problems in tributaries focuses in areas where native fish are expected to improve. Native fish remain the focus of restoration in part due to their status as sensitive species as well as the sympatric benefits to other species, including downstream nonnative salmonids.

Correcting fisheries impairments at a watershed scale will involve: 1) protection of existing high quality tributary habitats, 2) restoring areas that are compromised, and 3) and a higher level of commitment to proper riparian management than currently exists in many areas of the Blackfoot Watershed. Correcting impairments must also be considered within the context of established native species recovery and conservation plans. Bringing technical expertise, educational programs, landowner incentives and additional monitoring

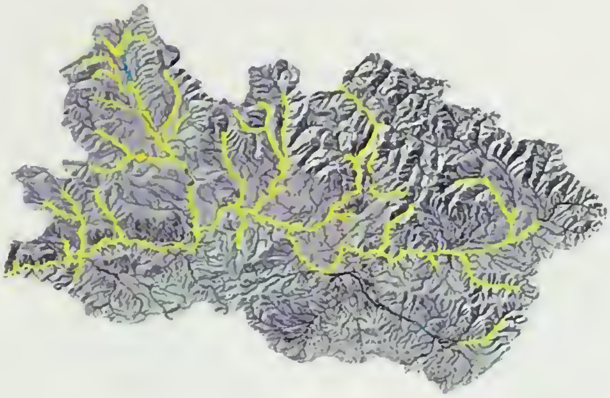
commitment to willing cooperators are necessary components to reversing fisheries impairments.

4.4.3 Whirling Disease

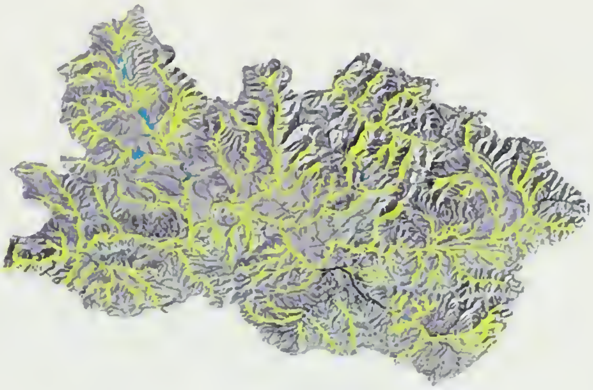
At this time, restoration planning in many stream reaches requires consideration of whirling disease, which is now firmly established at the low elevations of the watershed. Whirling disease, caused by the myxosporean parasite *Myxobolus cerebralis*, was first detected in the Blackfoot River in 1995 near Ovando. Since then, the disease has increased in distribution and intensity. It now infects the lower 122 miles of the mainstem Blackfoot River and continues to expand in the lower reaches of some tributaries (Figure 4-7). FWP is attempting to determine the extent of whirling disease containment at the low elevations of the watershed. The current distribution of whirling disease overlaps with the distribution of rainbow trout and brown trout reproduction and occurs at levels harmful to rainbow trout populations in many streams.

Blackfoot River native WSCT and bull trout appear to have a diminished risk of contracting whirling disease, due in part, to habitat use and life history strategies that entail spawning and rearing in upper tributaries. Whirling disease severity typically increases in the downstream direction in Blackfoot River tributaries. This inverse relationship between elevation and infection may be a result of the parasite's lack of time in the area, low numbers of myxospores in the environment, or a lack of suitable habitat supporting *T. tubifex*.

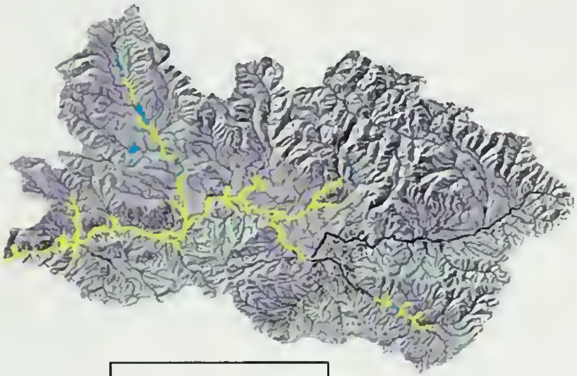
Strategies to help moderate impacts of whirling disease are incorporated into this action plan. These include: 1) improving migration corridors and rearing areas between headwater spawning streams and the Blackfoot River; 2) targeting restoration of native populations of WSCT and bull trout, whose life history could help reduce risk of infection by allowing the continual recruitment of these species to downstream river reaches; 3) habitat restoration - developing compatible streamside grazing practices, removing streamside feedlots and other methods of lowering sediment and nutrient input to streams: and 4) reducing other stress or mortality factors on trout populations such as ditch entrainment, low flows, poor habitat, etc.



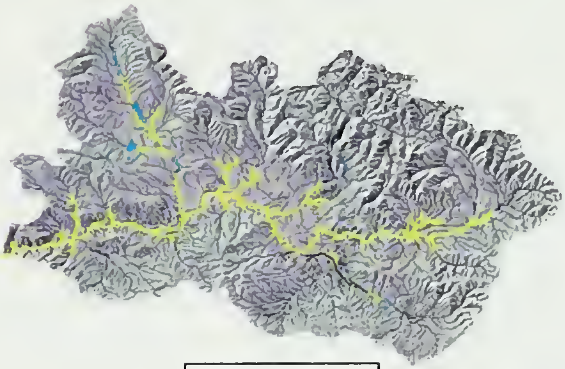
BULL TROUT



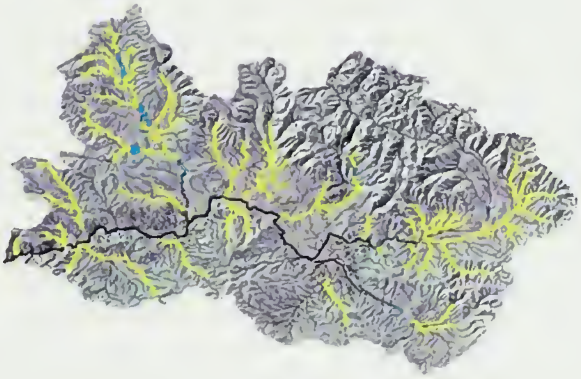
WESTSLOPE CUTTHROAT TROUT



RAINBOW TROUT



BROWN TROUT



BROOK TROUT

Figure 4-1. Distribution Map of Five Salmonid Species in the Blackfoot River Basin.

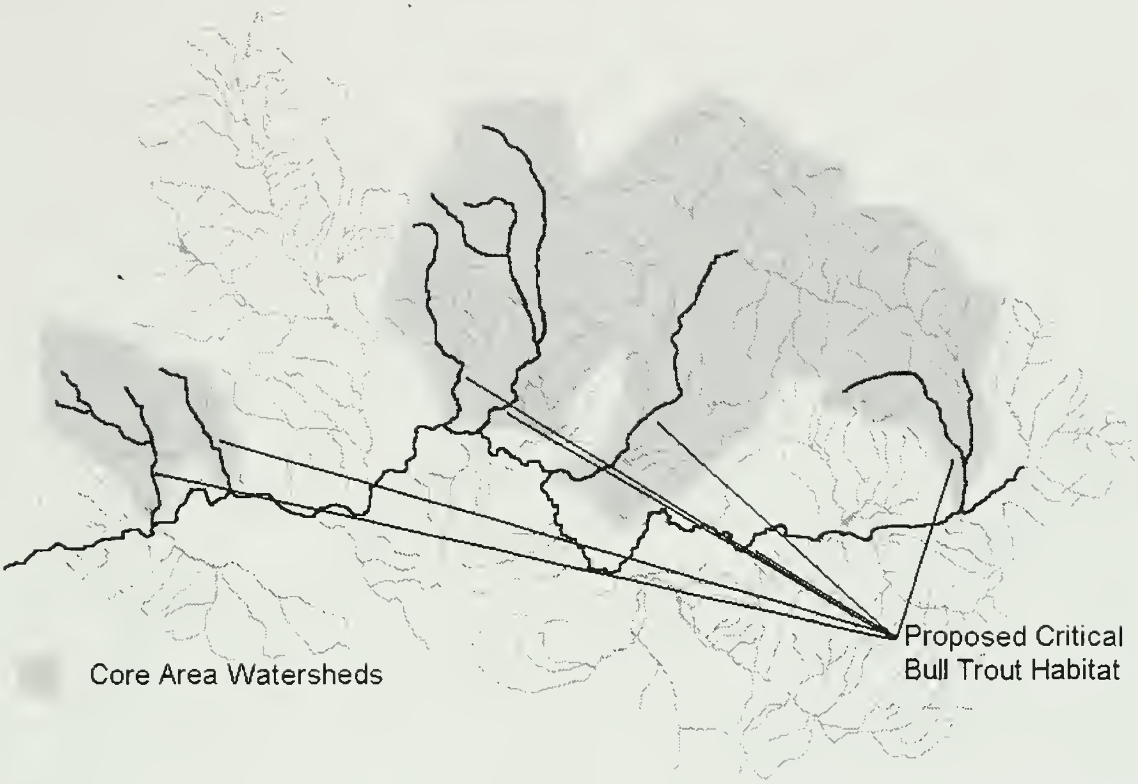


Figure 4-2. Bull trout core area watersheds (excluding the Clearwater River drainage) and proposed critical bull trout habitat.

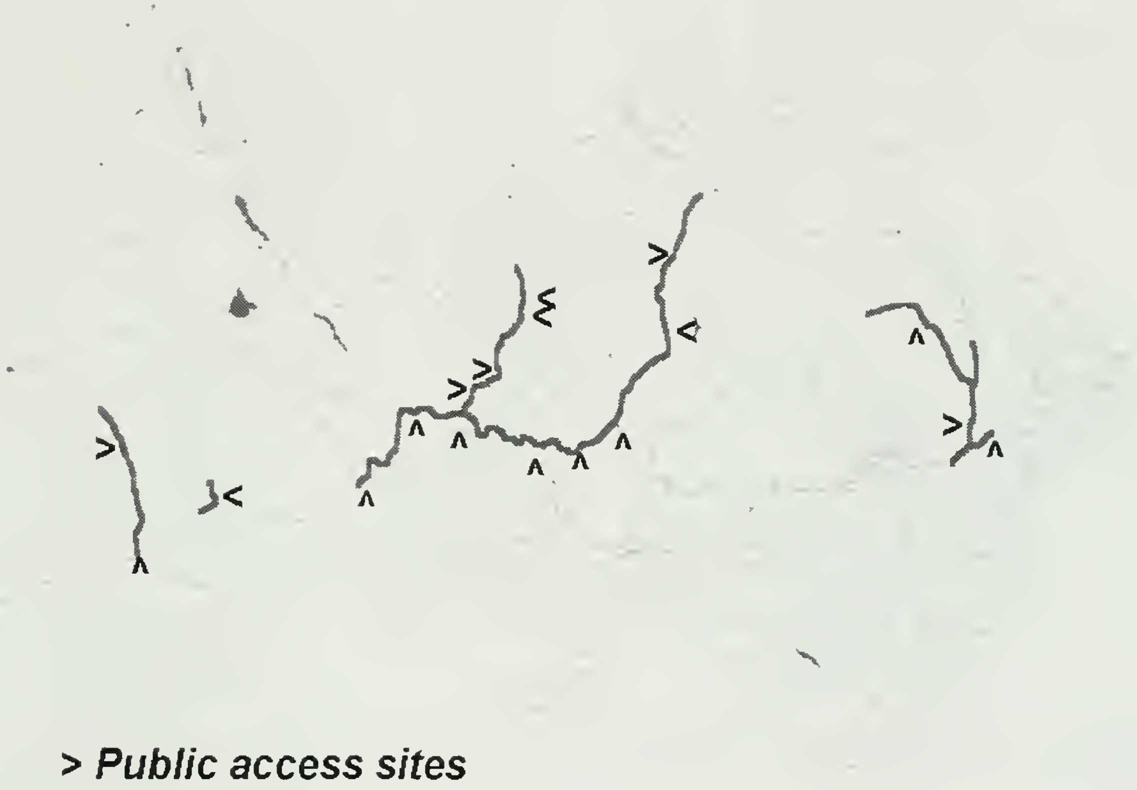


Figure 4-3. Bull trout recovery/recreational conflict areas for the Blackfoot Watershed.

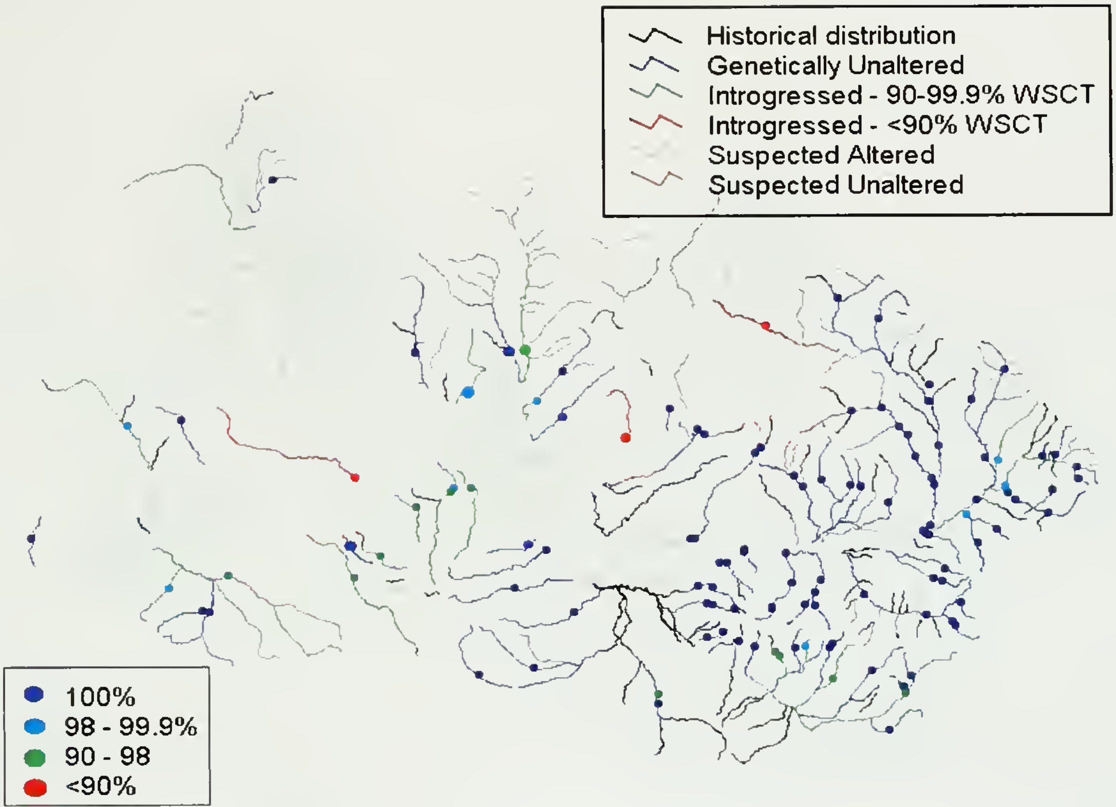


Figure 4-4. Westslope Cutthroat Trout Genetics Map with Sample Locations and Percent WSCT Composition.

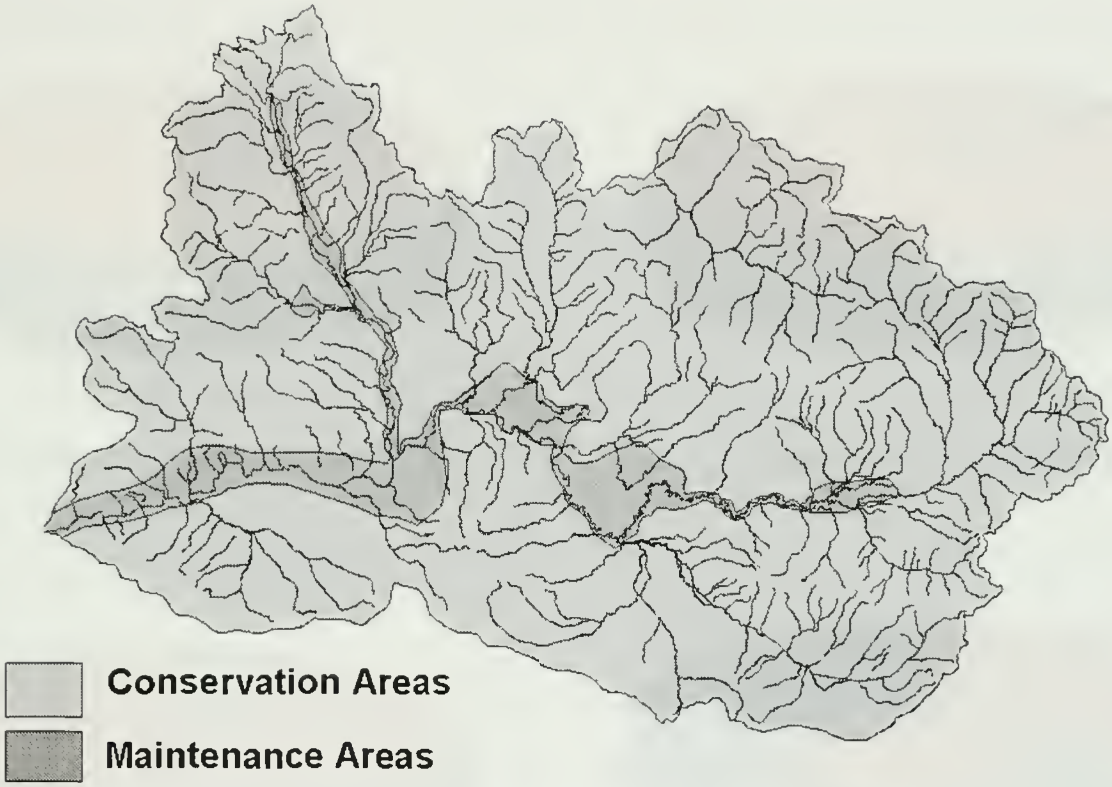
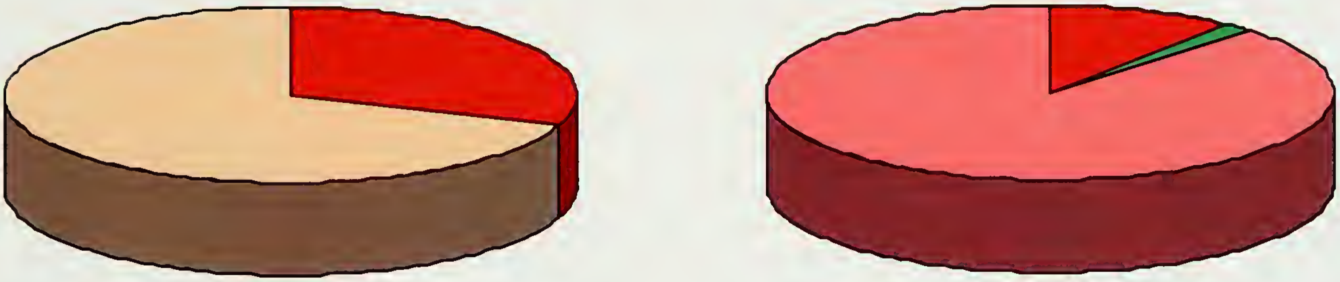


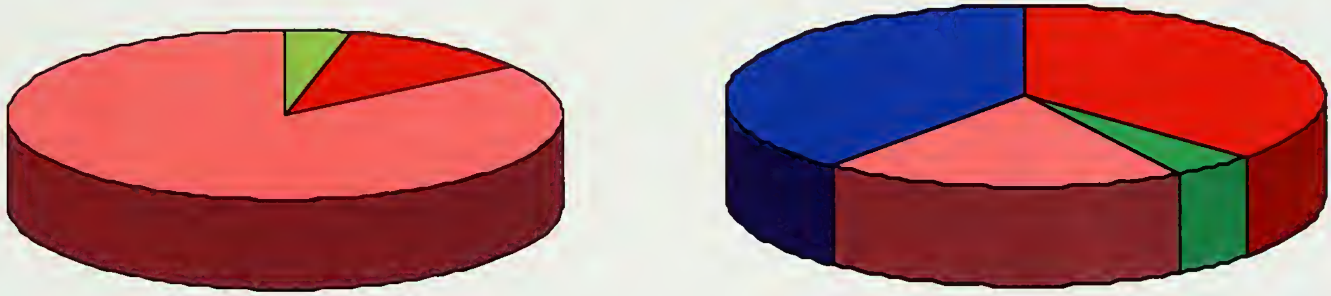
Figure 4-5. Region 2 Native Species Management Areas for the Blackfoot River Watershed.

Figure 4-6. Percent Trout Species Composition for Five Reaches of the Blackfoot River



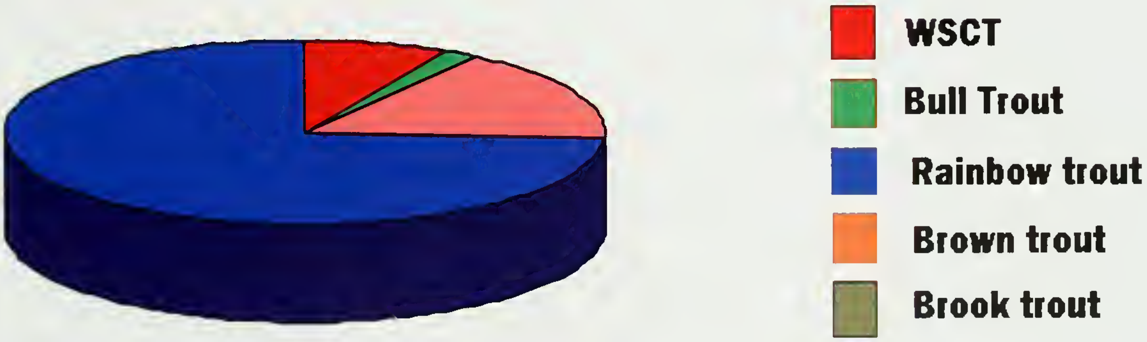
Reach 1: Flescher pass Section 1999

Reach 2: Canyon Section 1999



Reach 4: Wales Creek Section 2004

Reach 5: Scotty Brown Bridge Section 2004



Reach 6: Johnsrud Section 2004

Figure 4-7. Generalized Whirling Disease Distribution Map for the Blackfoot Watershed.

TABLE 4-1. ANTHROPOGENIC FISHERIES IMPAIRMENT ON 108 INVENTORIED STREAMS OF THE BLACKFOOT WATERSHED

Type of impact	# Streams
Concentrated livestock in riparian areas (feedlots, grazing)	58
Riparian vegetation	53
Lack of complexity	45
Instream flow	43
Irrigation (entrainment, dewatering, fish passage)	42
Channel alterations	42
Road crossings and road drainage	32
Recreational (illegal harvest, high angler pressure, stream damage)	10
Whirling disease	12
Mining	9
Residential	5

5.0 FISHERIES RESTORATION PRIORITIZATION

5.1 FISHERIES PRIORITIZATION STRATEGY

At the request of the Blackfoot Challenge, FWP updated a fisheries restoration prioritization matrix established by Pierce et al. (2002) for use by BBCTU, FWP and USFWS and their restoration partners. Nineteen (19) additional tributaries were inventoried since 2001 and six reaches of the Blackfoot River were added: (1) mouth to Clearwater, (2) Clearwater to NF, (3) NF to Nevada Creek, (4) Nevada Creek to Arrastra, (5) Arrastra to Lincoln, and (6) Lincoln to headwaters, bringing the total number of prioritized water bodies to 108. FWP incorporated the 303(d) list of water quality impaired streams and dewatered stream list into the prioritization matrix. This allowed TMDL and long-term water conservation strategies to be considered within a context of overall fisheries priorities. FWP then re-prioritized and ranked all water bodies using multiple criteria. FWP based stream scores on a hierarchical point system with emphasis on biological benefits (150 total possible points) along with social and financial considerations (50 total possible points).

FWP fisheries personnel (Ron Pierce, Don Peters, Ryen Aasheim and Craig Podner) were given the job of assigning data input and corresponding point values to the matrix. Scoring of some criteria (primarily social and financial considerations) necessarily relied on past landowner interviews, direct knowledge of tributaries, along with professional expertise and committee judgment for inventoried non-project streams.

For the biological benefits section of the matrix, streams with documented bull trout use received scores of 10, 20, 30 or 40 points, depending on whether the stream supported spawning (20 points), rearing (10 points) or is a designated bull trout "core area" stream (10 points). Compared with other criteria, streams supporting bull trout received more points due to their: 1) "threatened" status under ESA along with State and Federal priorities for the recovery of this species; 2) high potential for improvement in the Blackfoot watershed; and 3) downstream and sympatric benefits to other species resulting from bull trout recovery efforts.

For streams supporting WSCT, an additional zero to 20 points were possible, depending on whether a stream supported no WSCT (zero points), resident WSCT (10 points) or fluvial WSCT use (20 points). Fluvial WSCT streams received a higher score than streams supporting resident fish due to 1) the precarious status of the fluvial life-history, 2) high sport fish value to the Blackfoot River, and 3) downstream and sympatric benefits to other species resulting from WSCT recovery efforts. Streams with fluvial WSCT status (20 points) were those identified through 1) telemetry studies, 2) direct observations of fluvial-sized fish by fisheries personnel, or 3) direct tributaries to the Blackfoot River and biologically connected during high flows periods.

Streams received an additional zero, 10 or 20 points based on sport fishery value to the Blackfoot River. Streams with no sport fishery value (disjunct from the Blackfoot River) received zero points, single species sport fishery value (non-disjunct usually with WSCT) received 10 points, while non-disjunct streams that provide recruitment of multiple species

(bull trout, WSCT, rainbow and brown trout) to the Blackfoot River received 20 points. We assumed connected streams supporting rainbow trout, brown trout and bull trout provided sport fishery value to the Blackfoot River. We assumed small non-direct and non-fluvial headwater tributaries to support primarily resident WSCT and as such were not considered as providing sport fishery value to the Blackfoot River. We did not consider brook trout in this ranking due to their limited use of the Blackfoot River and adverse biological impacts to native species.

Stream restoration technical feasibility was also considered with zero points for not feasible and 20 points for streams considered technically feasible to restore. Streams with acid mine drainage or heavy metals (upper Blackfoot River and tributaries are not considered in this report), large instream reservoirs (upper Nevada Creek, Frazier Creek, and Wales Creek), over-appropriated water rights (lower Nevada Creek), major highway problems (Chimney Creek), and fully restored (Grantier Spring Creek) were considered not technically feasible to restore for the purposes of this report.

In addition to fisheries and feasibility criteria, streams with potential to increase instream flows (e.g. irrigation salvage potential) in the Blackfoot River were allotted 20 points. Finally, under the biological ranking section, streams with potential to improve downstream water quality by reducing: 1) instream sediment (10 points), 2) water temperature (10 points), and 3) nutrient loading (10 points) could earn up to an additional 30 points. This water quality point system was developed independent of 303(d) impaired stream list.

For social and financial considerations, FWP used three criteria: 1) landowner and land manager cooperation (5, 10, 15 or 20 points) - a measure of perceived landowner cooperation; 2) cost-effectiveness (5, 10 or 20 points) – an estimate of project cost/mile; and 3) demonstration/educational value of potential projects (5 or 10 points) - a measure of project uniqueness, landowner interest and project access.

FWP transferred matrix values to an EXCEL spreadsheet (Appendix E). For this report, we sorted all 108-stream bodies by total score and then prioritized streams by total rank. High scores are high priorities and are represented as low ranking values. For instance Monture Creek received the highest total score (175 points) for all streams and thus ranked 1st in total priority. FWP used this scoring and ranking method for all categories that rely on several numerical fields.

FWP scored and ranked all 108 streams by: 1) total rank, 2) biological rank, 3) native species rank (bull trout and WSCT fields), 4) sport fishery value, 5) potential to increase instream flow to the Blackfoot River, 6) potential for downstream water quality improvements, and 7) social and financial considerations (Appendix E). FWP then sorted the scorecard by the primary priority criteria (total rank, biological rank, and native species rank) and plotted histogram and associated cumulative percent values. For clusters of class values that approximated the 0-33, 34-66, and 67-100 percentiles, FWP assigned a respective high, moderate and low priority value (Figure 5-1). FWP also added dewatered stream list and by DEQ 303(d) list to the matrix and sorted these streams by total restoration priority (dewatered stream list – Table 5-1; 303(d) list – Table3-1).

5.2 DEWATERED STREAMS PRIORITIZATION

Stream dewatering, whether natural or human induced, can result in significant fisheries declines. In many cases, these declines can be mitigated by: 1) managing for native species whose life histories have evolved with cycles of drought; 2) managing water use (instream flows) in specific water bodies based on specific population needs, and by 3) restoring habitat quality by correcting human-induced limiting factors that either exacerbate drought or introduce additional stressors upon fish communities.

In order to develop long-term water conservation strategies under the Blackfoot Emergency Drought Response Plan, FWP added the dewatered stream list to the Action Plan prioritization (Table 5-1). Dewatering refers to a reduction in the stream-flow (natural and human-related) below the point in which habitat is deemed adequate for fish. This FWP generated list is based on direct field observations, measured flows, instream flow models, fisheries assessments and biological opinion. This allowed FWP to identify and prioritize instream flow enhancement projects consistent with biological priorities.

The dewatered stream list contains 54 water bodies (excluding the Clearwater River upstream of Blanchard Creek) and an estimated 194 miles of affected stream (Figure 5-2). Of this total, natural dewatering on 17 streams and totals 49 river miles, which includes 11 miles of the upper Blackfoot River. Human-related dewatering occurs on an estimated 45 tributaries and influences an estimated total of 165 miles and includes ~34 miles of the middle Blackfoot River. A combination of both natural and human-related dewatering occurs on 8 streams.

5.3 OTHER CONSIDERATIONS

This FWP prioritization scheme attempts to guide the limited resources of the Blackfoot Cooperators to biologically important tributaries located primarily on private lands. Although the prioritization is intended to guide restoration activities, as new information becomes available and as additional limiting factors are identified, priorities may shift. Good restoration opportunities may occur among the low priority streams, prompting restoration actions. FWP recognizes unique restoration opportunities may be presented, and that continued input from landowners and managers will help guide the Blackfoot River restoration initiative.

It is important to note that the ranking criteria does not consider many complex restoration-related issues, such as: 1) fisheries potential of sites, 2) potential contribution to connected systems, 3) severity of impacts to other systems, 4) population size, 5) native and non-native species interactions, 6) WSCT genetic concerns, 6) numerical water quality standards and criteria, or 7) industrial-scale timber harvesting practices, public land or hard-rock mine drainage issues, or 8) other specific agency programs geared toward fisheries and water quality improvements. Some of these issues are covered in the native species issues section and individual stream results section. Others should be considered on a project specific basis during early restoration development phases. Note also that, although the Clearwater

drainage is being assessed for TMDLs, local and state fisheries issues have not been addressed and will be incorporated when available.

5.4 PRIORITIZATION RESULTS

The results section begins by organizing all priority streams based on the total biological priority (high, moderate and low) classes. For these three classes, the names and locations of water bodies are referenced in maps that are numerically referenced to tables. These groupings include a brief discussion of restoration, recovery and conservation guidelines common to each priority class.

Appendix D includes the individual descriptions of all 108 water bodies. Each water body description outlines general impairments, fish species present and specific fisheries information related to the recovery and conservation of imperiled native species, as well as information related to recreational fisheries and TMDL issues. These tributaries are organized first by total biological priority and then by descending alphabetical order.

Appendix E contains the summary tables showing the prioritization of total restoration, biological, native species priorities as well as the dewatered stream sorted by total biological priority.

5.4.1 High Priority Streams

Of the 108 stream bodies, thirty-four received a high total priority rank (Figure 5-3). Projects in these watersheds will be considered as high priorities for fisheries funding and project development under the action plan. Streams bodies in this category include: 1) three reaches of the mainstem Blackfoot River, 2) all major bull trout spawning streams, and 3) other direct tributaries to the Blackfoot River including several from the Garnet Mountains. These streams are biologically connected to the Blackfoot River, and generally support the strongest native fish populations.

Tributaries originating in the northern mountains within the watershed are generally the larger streams. Headwaters range from USFS lands with wilderness designation to intensively managed private industrial forestlands. To varying degrees, these streams represent some of the best opportunities to protect, restore and manage essential habitats occupied by communities of both fluvial WSCT and bull trout. In lower stream reaches, several also support important recreational rainbow and brown trout fisheries, as well as brook trout. From a planning perspective, projects for these streams should be consistent with bull trout recovery plans and fluvial WSCT conservation plans unless site-specific measures suggest other actions.

The Garnet Mountain streams ranked high due in part to water quality, flow enhancement potential and social considerations. These streams all possess human-induced limiting factors related to habitat problems. Streams in this category generally contain fluvial WSCT and other species important to the Blackfoot River sport fishery.

Listed 303(d) streams in the high priority category are: 1) Monture Creek, 2) Belmont Creek, 3) Rock Creek, 4) Kleinschmidt Creek, 5) Blanchard Creek, 6) Warren Creek, 7) Elk Creek, 8) Blackfoot River reaches 1, 2 & 4, and 9) McElwain Creek.

5.4.2 Moderate Priority Streams

Thirty-four stream reaches fall in to the "moderate priority" category (Figure 5-4). Streams in this category would receive a moderate level of consideration for funding of fisheries-related restoration. Streams include three reaches of the upper Blackfoot River, many low-elevation tributaries to the Blackfoot River including several spring creeks, as well as a few outliners, including disjunct streams located higher in the watershed.

Most of the reaches that we consider moderate priorities are small direct tributaries to the Blackfoot River. Most of these are biologically and hydrologically (surface water) connected to the main stem Blackfoot River continually or during high flow periods. These tributaries support fluvial and stream resident WSCT and most support WSCT spawning and rearing. The tributaries should be generally viewed from a WSCT metapopulation conservation perspective. The lower portions of these tributaries variably contain rainbow trout, brown trout and brook trout. Streams generally support genetically unaltered WSCT in the upper watershed and introgressed WSCT in tributaries of the lower Blackfoot Watershed. With one exception (Arrastra Creek), these tributaries lack bull trout reproduction although many support limited bull trout rearing.

Other moderate priority streams are found both north and south of the general distribution pattern. The northern streams include lower priority bull trout core area streams. Stream on the south include several with potential for water quality and flow improvement or area ranked high with respect to social considerations.

Most streams in this moderate priority category support human-induced limiting factors and many controllable sources of fish mortality, such as entrainment of fish in irrigation ditches and stream dewatering. Most habitat-related problems can be reasonably corrected with sufficient commitment from landowners and resource managers. We have already begun to implement restoration project on many of these streams.

Streams on the 303(d) list considered moderate priority include: 1) Blackfoot River reaches 3, 5 and 6, 2) Nevada Spring Creek, 3) Yourname Creek, 4) Wales Creek, 5) Arrastra Creek, 6) Douglas Creek, 7) upper Nevada Creek, 8) Union Creek, 9) upper Willow Creek, and 10) Black Bear Creek.

5.4.3 Low Priority Streams

Forty streams ranked in the "low priority" category (Figure 5-5). Low-priority streams will not receive the same level of fisheries restoration consideration as high or moderate priority streams without a concerted local effort. However, despite a low ranking, most low priority streams possess locally valuable fisheries or potential for recovery. The majority (28) of low priority streams fall into two large sub-basins (Union Creek and Nevada Creek) of the

Blackfoot watershed. In these areas, reservoirs, subdivision and agriculture have either greatly reduced, or eliminated the biological connection with the mainstem. These streams no longer support fluvial native fish or contribute significantly to sport fisheries of the Blackfoot River. Rather, these are generally small headwater streams supporting stream resident WSCT or are degraded reaches that do not support salmonids.

Several low priority streams possess site-specific stream resident WSCT concerns that will be considered before restoration activities involving fish passage are implemented. Where WSCT populations are physically isolated, restoration measures should preserve the genetic integrity of ‘pure’ populations, fully consider downstream influences, and avoid exposure to hybridizing and invasive species. Where fisheries restoration is pursued, it should generally be conducted from the headwaters in a downstream direction. These methods would focus on expanding the size of individual populations by improving habitat conditions in headwater areas. This approach should improve populations, while providing sufficient time to evaluate: 1) the influence of climate change, 2) expansion potential of unwanted species, 3) disease risks, and 4) the efficacy of differing restoration methods implemented on similar streams. In all cases involving resident WSCT streams, FWP fisheries biologists should be involved in restoration planning from the onset.

Streams on the 303(d) list considered low priority include: 1) Camas Creek, 2) Murray Creek, 3) Washoe Creek, 4) Buffalo Gulch, 5) Cottonwood Creek (trib of Nevada Creek), 6) Jefferson Creek, 7) lower Nevada Creek, 8) Washington Creek, 9) Frazier Creek, 10) Gallagher Creek, and 11) Ward Creek.

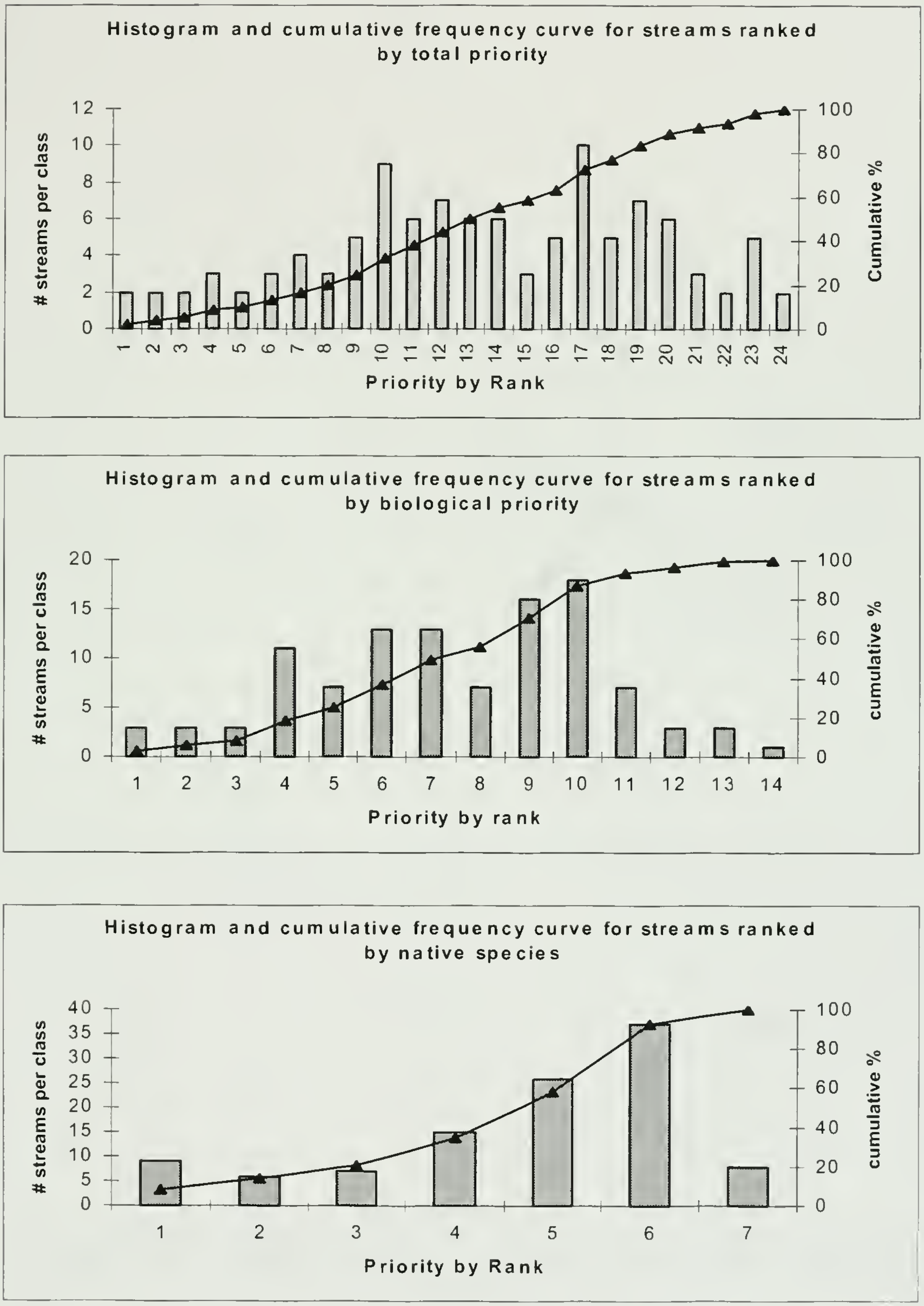


Figure 5-1. Histograms and Cumulative Percentage Curves used to Develop Prioritization Categories.

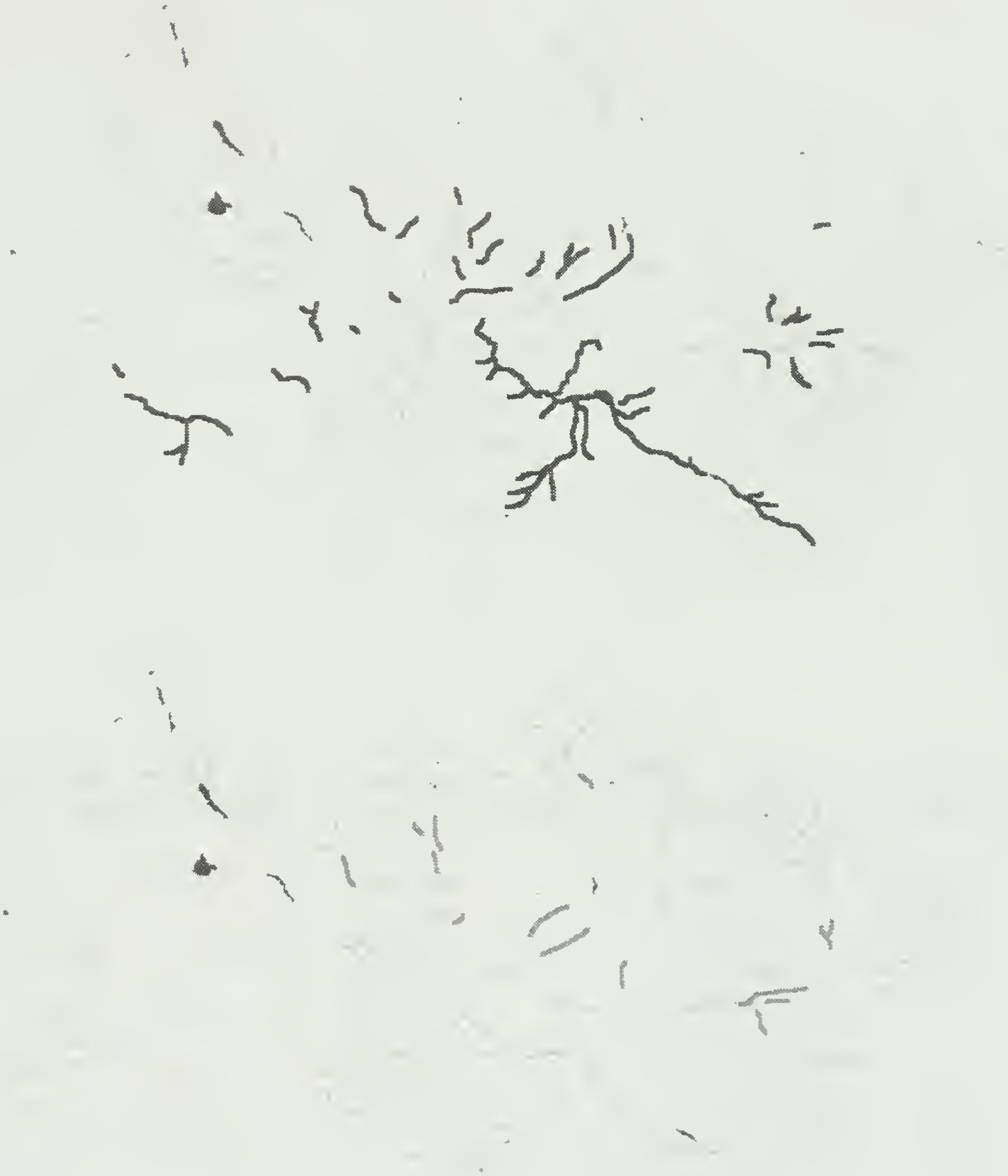
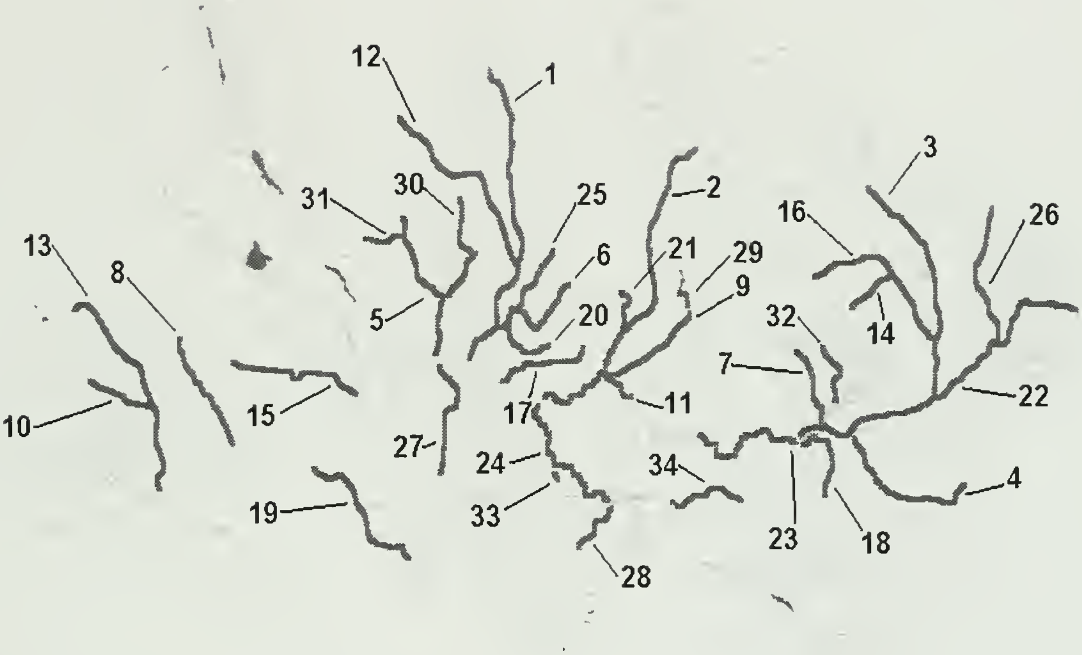
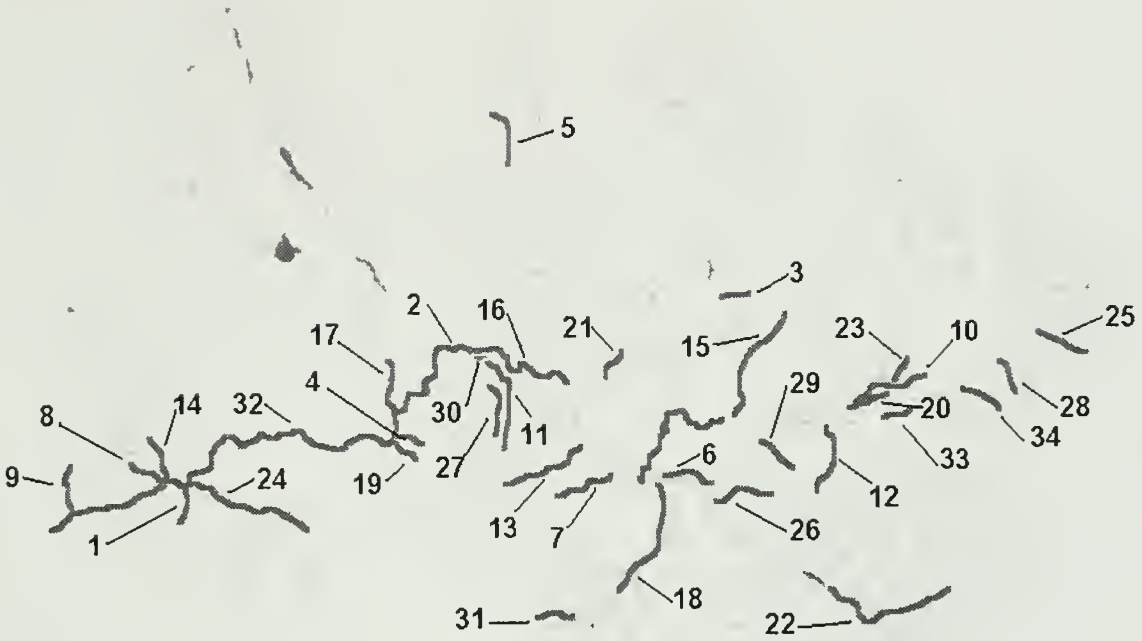


Figure 5-2. Dewatered Streams of the Blackfoot Watershed: Human Induced (top) and Natural Dewatering (bottom).



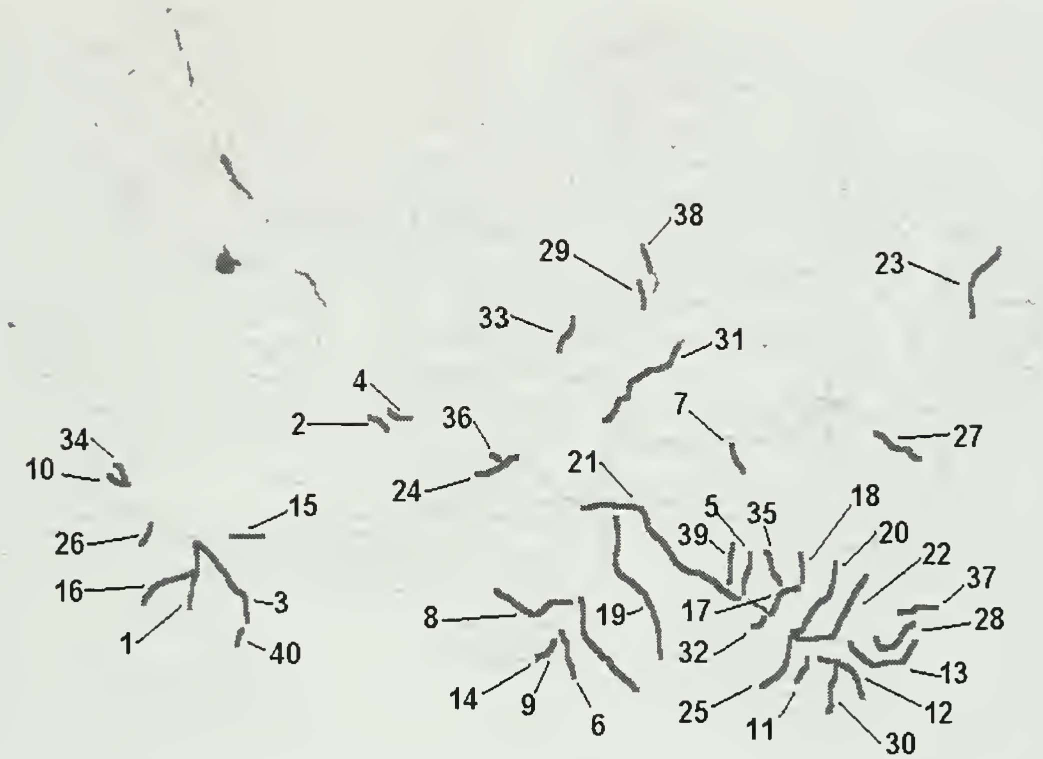
Stream ID #	Stream Name	Total Rank	Stream ID #	Stream Name	Total Rank	Stream ID #	Stream Name	Total Rank
1	Monture Creek	1	12	Dunham Creek	6	23	Blackfoot River 2	9
2	N.F. Blackfoot R.	1	13	Gold Creek	6	24	Blackfoot River 4	9
3	Landers Fork	2	14	Snowbank Creek	6	25	McCabe Creek	9
4	Poorman Creek	2	15	Blanchard Creek	7	26	Alice Creek	10
5	Cottonwood Cr. (R.M.43)	3	16	Copper Creek	7	27	Chamberlain Creek	10
6	Dick Creek	3	17	Warren Creek	7	28	McElwain Creek	10
7	Beaver Creek	4	18	Willow Cr. (lower)	7	29	Salmon Creek	10
8	Belmont Creek	4	19	Elk Creek	8	30	Shanley Creek	10
9	Rock Creek	4	20	Hoyt Creek	8	31	Spring Cr.(Cottonwood)	10
10	Gold Creek, W.F	5	21	Spring Creek (N.F.)	8	32	Stonewall Creek	10
11	Kleinschmidt Cr.	5	22	Blackfoot River 1	9	33	Wales Spring Creek	10
						34	Wasson Creek	10

Figure 5-3. High Priority Streams of the Blackfoot River Watershed.



Stream ID #	Stream Name	Total Rank	Stream ID #	Stream Name	Total Rank	Stream ID #	Stream Name	Total Rank
1	Bear Creek (R.M.12.2)	11	12	Saurekraut Creek	12	23	Sucker Creek	14
2	Blackfoot River 3	11	13	Wales Creek	12	24	Union Creek	14
3	Little Fish Creek	11	14	West Twin Creek	12	25	Willow Cr. (upper)	14
4	Dry Creek	11	15	Arrastra Creek	13	26	Wilson Creek	14
5	Lodgepole Creek	11	16	Blackfoot River 5	13	27	Chamberlain EF	15
6	Nevada Spring Cr.	11	17	Clearwater River	13	28	Hogum Creek	15
7	Yourname Creek	11	18	Douglas Creek	13	29	Moose Creek	15
8	East Twin Creek	12	19	Fish Creek	13	30	Basin Spring Creek	16
9	Johnson Creek	12	20	Lincoln Spring Cr.	13	31	Black Bear Creek	16
10	Keep Cool Creek	12	21	Jacobsen Spring Creek	14	32	Blackfoot River 6	16
11	Pearson Creek	12	22	Nevada Cr.(upper)	14	33	Grantier Spring Cr.	16
						34	Seven up Pete Cr	16

Figure 5-4. Moderate Priority Streams of the Blackfoot River Watershed.



Stream ID #	Stream Name	Total Rank	Stream ID #	Stream Name	Total Rank	Stream ID #	Stream Name	Total Rank
1	Ashby Creek	17	14	Sturgeon Creek	18	27	Humbug Creek	20
2	Bear Creek (R.M.37.5)	17	15	Washoe Creek	18	28	Shingle Mill Creek	20
3	Camas Creek	17	16	Arkansas Creek	19	29	Bear Creek trib. to N.F.	21
4	Chamberlain WF	17	17	Buffalo Gulch	19	30	Strickland Creek	21
5	Chicken Creek	17	18	California Gulch	19	31	Ward Creek	21
6	Chimney Cr. (Douglas)	17	19	Cottonwood Cr. (Nev.)	19	32	Indian Creek	22
7	Little Moose Creek	17	20	Jefferson Creek	19	33	Warren Creek,Doney Lake	22
8	Murray Creek	17	21	Nevada Cr. (lower)	19	34	Burnt Bridge Creek	23
9	Sheep Creek	17	22	Washington Creek	19	35	Clear Creek	23
10	Warm Springs Cr.	17	23	Bartlett Creek	20	36	Frazier Creek, NF	23
11	Finn Creek	18	24	Frazier Creek	20	37	Gleason Creek	23
12	Halfway Creek	18	25	Gallagher Creek	20	38	McDermott Creek	23
13	Mitchell Creek	18	26	Game Creek	20	39	Chimney Cr. (Nevada)	24
						40	Smith Creek	24

Figure 5-5. Low Priority Streams of the Blackfoot River Watershed.

TABLE 5-1. DEWATERED STREAM LIST FOR THE BLACKFOOT WATERSHED

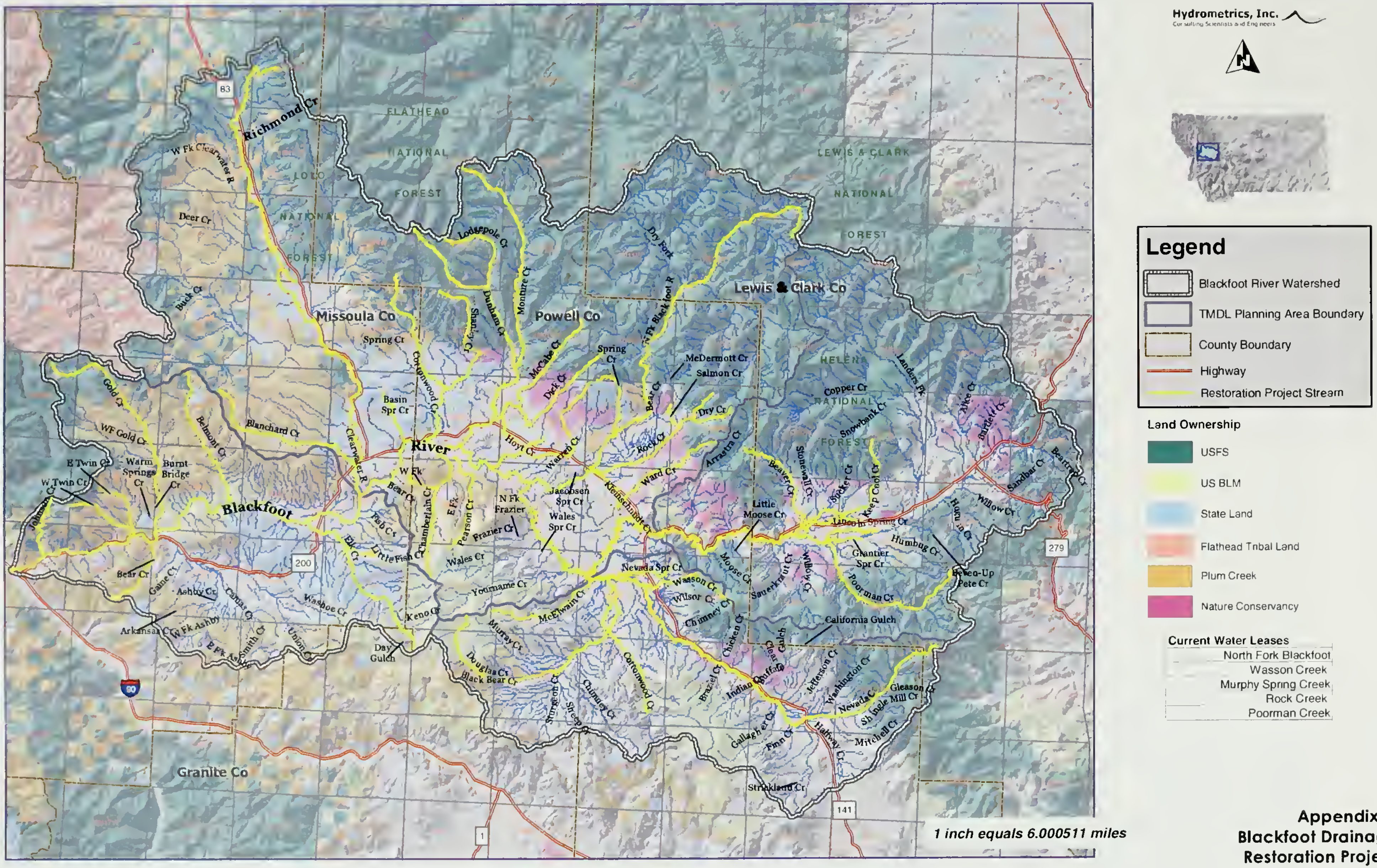
Stream Name	Affected Length	Natural	Human	Both
Arkansas Creek	2		2	
Ashby Creek	2		2	
Arrastra Creek (sm 4.5-2.0)	2.5	2.5		
Bear Creek (North Fork)	1	1	1	x
Blackfoot River (Seven-Up Pete-Poorman Creek)	11	11	3	x
Blackfoot River (54.1 - 84.9)	30.8		30.8	
Blanchard Creek	1.2		1.2	
Burnt Bridge Creek	1		1	
Chamberlain Creek	1		1	
Chimney Creek (Nevada Creek)	0.5		0.5	
Chimney Creek (Douglas Creek)	3.5		3.5	
Clearwater River	3.5		3.5	
Copper Creek	1	1		
Cottonwood Creek rm 43.0 (sm 10.0-4.4)	5.6	2.8	2.8	x
Cottonwood Creek (Douglas Creek)	5		5	
Dick Creek (sm 3.5-6.0)	2.5	2.5	2.5	x
Douglas Creek	14		14	
Dry Creek (trib to Rock Creek)	0.5	0.5		
Dry Fork (trib to North Fork)	2	2		
Dunham Creek	5	4	1	x
Elk Creek	3		3	
Fish Creek	0.3		0.3	
Frazier Creek	1.5		1.5	
Frazier Creek, North Fork	0.5		0.5	
Gallagher Creek	3		3	
Hoyt Creek	1		1	
Humbug Creek	1	1		
Jefferson Creek	1		1	
Keep Cool	2		2	
Landers Fork (3.6-4.5)	1	1		
McCabe Creek	2		2	
McElwain Creek	1		1	
Monture Creek (12.0-15.0)	3	3		
Murray Creek	3	3		
Nevada Creek (sm 31.7-6.4)	25.3		25.3	
Nevada Creek (sm 40.0-34)	6		6	
North Fork of Blackfoot River (rm 12.0-6.2)	5.8	5.8	5.8	x
Pearson Creek	2	2		
Poorman Creek	2	2	2	x
Rock Creek (1.4-7.0)	5.6	5.6	5.6	x
Shanley Creek	1.6		1.6	
Spring Creek (trib to Cottonwood Creek)	1		1	
Spring Creek (trib to North Fork)	2.5		2.5	
Snowbank Creek	0.4		0.4	

TABLE 5-1. DEWATERED STREAM LIST FOR THE BLACKFOOT WATERSHED (continued)

Stream Name	Affected Length	Natural	Human	Both
Stonewall Creek	2	1	1	x
Sucker Creek	1		1	
Union Creek (sm 7.0-0.5)	6.5		6.5	
Wales Creek	1.9		1.9	
Warm Springs Creek	1		1	
Warren Creek	6		6	
Washington Creek (Section 24 and 26)	1		1	
Wasson Creek	2		2	
Willow Creek (lower)	2		2	
Wilson Creek	0.8		0.8	
Yourname Creek	1		1	
Totals	**196.3**	**51.7**	**164.5**	

APPENDIX A

COMPLETED RESTORATION PROJECTS IN THE BLACKFOOT WATERSHED



Appendix A
Blackfoot Drainage Restoration Project Inventory Map

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Appendix A - Completed Restoration Projects in the Blackfoot Watershed

Stream Name	Number of Projects	Number of Landowners	Projects
Basin Spring Creek	11	2	Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve wetlands; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
Bear Creek (RM 12.2)	11	3	Fish passage improvements; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
Beaver Creek	16	2	Fish passage improvements; Prevent irrigation ditch losses; Channel restoration; Improve wetlands; Improve irrigation
Belmont Creek	3	1	Fish passage improvements; Spawning habitat protection; Improve range/riparian habitat
Blackfoot River (Clearwater to mouth)	6	4	Improve instream flows; Improve irrigation
Blackfoot River (North Fork to Clearwater)	13	8	Improve instream flows; Improve wetlands; Improve range/riparian habitat
Blackfoot River (Lincoln to North Fork)	44	18	Channel restoration; Riparian vegetation improvements; Improve instream flows; Improve wetlands; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
Blanchard Creek	4	1	Fish passage improvements; Riparian vegetation improvements; Improve range/riparian habitat; Improve irrigation
Chamberlain Creek	19	3	Fish passage improvements; Prevent irrigation ditch losses; Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve wetlands; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
Chamberlain Creek (West Fork)	1	1	Improve range/riparian habitat
Clearwater River	5	2	Prevent irrigation ditch losses; Improve instream flows; Improve range/riparian habitat
Cottonwood Creek (RM 43)	15	3	Fish passage improvements; Prevent irrigation ditch losses; Riparian vegetation improvements; Improve instream flows; Improve wetlands; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
Cottonwood Creek (Nevada)	6	1	Fish passage improvements; Channel restoration; Riparian vegetation improvements; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
Dick Creek	27	7	Fish passage improvements; Prevent irrigation ditch losses; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve wetlands; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
Douglas Creek	6	2	Fish passage improvements; Riparian vegetation improvements; Improve range/riparian habitat
Dry Creek	3	1	Riparian vegetation improvements; Improve range/riparian habitat; Remove streamside feedlots
Dunham Creek	10	3	Fish passage improvements; Prevent irrigation ditch losses; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve range/riparian habitat; Improve irrigation
Elk Creek	4	1	Channel restoration; Fish habitat improvement; Improve wetlands; Improve range/riparian habitat
East Twin Creek	1	1	Fish passage improvements

Appendix A - Completed Restoration Projects in the Blackfoot Watershed

Stream Name	Number of Projects	Number of Landowners	Projects
Gold Creek	2	2	Fish habitat improvement
Grantier Spring Creek	11	1	Fish passage improvements; Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat
Hoyt Creek	8	3	Fish passage improvements; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Improve irrigation
Johnson Creek	1	1	Fish passage improvements
Keep Cool Creek	1	1	Riparian vegetation improvements; Improve range/riparian habitat
Kleinschmidt Creek	19	4	Fish passage improvements; Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Remove streamside feedlots
Lincoln Spring Creek	4	1	Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve range/riparian habitat
Lodgepole Creek	1	1	Fish passage improvements
McElwain Creek	2	1	Improve range/riparian habitat; Remove streamside feedlots
McCabe Creek	14	2	Fish passage improvements; Prevent irrigation ditch losses; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve range/riparian habitat; Improve irrigation
Monture Creek	23	5	Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve wetlands; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
Nevada Creek	17	4	Fish passage improvements; Channel restoration; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Improve irrigation
Nevada Spring Creek	21	3	Fish passage improvements; Prevent irrigation ditch losses; Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve wetlands; Improve range/riparian habitat; Remove streamside feedlots
North Fork Blackfoot River	23	11	Fish passage improvements; Prevent irrigation ditch losses; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve range/riparian habitat; Improve irrigation; Conservation easement
Pearson Creek	17	1	Fish passage improvements; Prevent irrigation ditch losses; Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve wetlands; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
Poorman Creek	9	2	Fish passage improvements; Channel restoration; Prevent irrigation ditch losses; Riparian vegetation improvements; Improve instream flows; Improve range/riparian habitat; Improve irrigation
Rock Creek	42	12	Fish passage improvements; Prevent irrigation ditch losses; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve wetlands; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots

Appendix A - Completed Restoration Projects in the Blackfoot Watershed

Stream Name	Number of Projects	Number of Landowners	Projects
Salmon Creek	18	3	Fish passage improvements; Prevent irrigation ditch losses; Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve wetlands; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
Shanely Creek	5	2	Prevent irrigation ditch losses; Riparian vegetation improvements; Improve instream flows; Improve range/riparian habitat; Improve irrigation
Spring Creek (North Fork)	5	6	Fish passage improvements; Prevent irrigation ditch losses; Improve instream flows; Improve wetlands; Improve irrigation
Ward Creek	8	6	Improve range/riparian habitat; Remove streamside feedlots
Warren Creek	34	8	Fish passage improvements; Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve wetlands; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
Wasson Creek	10	2	Fish passage improvements; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve instream flows; Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
West Twin Creek	1	1	Fish passage improvements

Total Project Streams: 41

Total Projects: 501

Total Landowners: 147

APPENDIX B

ONGOING AND POTENTIAL RESTORATION PROJECTS ON TMDL STREAMS

APPENDIX B: POTENTIAL RESTORATION PROJECTS ON TMDL STREAMS IN THE BLACKFOOT WATERSHED

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Project List?
BLACKFOOT HEADWATERS PLANNING AREA						
Blackfoot River from Headwaters to Landers Fork	Mine waste removal from floodplain	From the Anaconda/Beartrap Creeks confluence downstream 1 mile	Reduce metals loading; Improve habitat	Mixed private/public	Scheduled to be completed in 2006/07 by Asarco	Yes
Blackfoot River from Landers Fork to Nevada Ck	Weed management and revegetation, implement floodplain buffer, grazing BMPs				Identified in Sediment TMDL	Yes
Arrastra Creek	Culvert Replacement	Approximately 3 miles upstream of confluence with the Blackfoot River	Improve fish passage and flow/sediment conveyance	Public	Scheduled for implementation in 2005	Yes-Moderate
	Bridge installation	Approx 1 mi upstream of above culvert replacement		Private	Preliminary	
Beartrap Creek from Mike Horse Creek to mouth	Mine waste removal from floodplain	Beartrap Creek from Mike Horse Creek to mouth	Reduce metals loading; Improve habitat	Mixed private/public	Scheduled to be completed in 2006/07 by Asarco	No
Mike Horse Creek	Mine waste removal from floodplain	From Mike Horse Mine to confluence with Beartrap Ck	Reduce metals loading; Improve habitat	Mixed private/public	Scheduled to be completed in 2005/06 by Asarco	No
Poorman Creek	Swansea Mine reclamation	Swansea Gulch	Reduce metals loading; Improve habitat	Private	Identified in Metals TMDL	Yes-High
	Stream channel reconstruction in severely disturbed segment	RM 2.3 to 8.6	Restore aquatic habitat and limit excessive sedimentation	Private	Preliminary	Yes-High
	Riparian vegetation restoration, irrigation improvements	RM 0.0 to 2.3	Alleviate dewatering and restore aquatic habitat	Private	Identified in Sediment TMDL	

Listed Water	**Project(s)**	**Location**	**Objective(s)**	**Land Ownership**	**Status**	**On Fisheries Project List?**
	Road related sediment reduction measures, road crossing replacement (barrier and ford removal), road maintenance, road drainage rehabilitation and reclamation	Poorman Creek and tributaries. Stemple Pass Road and South Fork Road	Reduce sediment delivery from county roads, provide fish passage and improve habitat	County	Identified in Sediment TMDL and by DNRC and USFS	Yes-High
Sandbar Creek	Remove downstream-most mine waste pile	Approximately 1.0 mi upstream of H'way 279	Reduce metals loading	USFS	Identified in metals TMDL	No
	Remove upper mine waste pile and mine waste in road	Approximately 1.75 mi upstream of H'way 279	Reduce metals loading	USFS	Identified in metals TMDL	No
Willow Creek	Implement grazing BMPs, weed management, channel restoration, and abandoned mine reclamation				Identified in sediment TMDL	Yes – High
MIDDLE BLACKFOOT/NEVADA CREEK PLANNING AREA						
Washington Creek (upper)	None identified at this time					Yes – Low
Washington Creek (lower)	None identified at this time					Yes – Low
Jefferson Creek (upper)	None identified at this time					Yes – Low
Jefferson Creek (lower)	Grazing Management, Off-stream watering	Immediately above highway	Increase flow	Private	Near completion-done by NRCS	Yes – Low
Gallagher Creek	None identified at this time					Yes – Low
Buffalo Gulch	None identified at this time					Yes – Low
Braziel Creek	None identified at this time					No
Nevada Creek (headwaters to Nevada Lake)	Stream channel reconstruction/stabilization, grazing management, riparian plantings	At confluence with Halfway Ck	Reduce siltation in creek reservoir	Private	Implementation in 2005	Yes - Moderate

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Project List?
	Grazing management, Irrigation diversion structure	Just upstream of USGS gage station	Sediment reduction, Instream flows	Private	NRCS-project Fencing done, irrigation diversion in progress	Yes - Moderate
Nevada Creek (Nevada Lake to Blackfoot River)	Grazing management, Irrigation water management, stream restoration	From one mile to 2 miles below dam	Improve habitat; Sediment/temperature reduction/increase instream flow	Private	In negotiation phase with landowner	Yes – Low
	Streambank stabilization where encroaching on Helmville ditch berm, grazing management	Approx 3 miles downstream of dam	Prevent Creek from undercutting berm toe; Decrease sediment loading	Private	In negotiation phase with landowner	Yes – Low
	Grazing management	Approx 4 miles downstream of dam	Habitat enhancement; sediment/nutrient/temp. reduction	Private	Preliminary – Landowner not contacted yet	Yes - Low
Nevada Spring Creek	Fencing and off-site water development		Habitat enhancement; Sediment/temperature reduction	Private	Implementation in 2005 - 2006	Yes - Moderate
Black Bear Creek	None identified at this time					Yes - Moderate
Murray Creek	None identified at this time					Yes - Low
Douglas Creek (upper)	None identified at this time					Yes - moderate
Douglas Creek (lower)	Grazing Management: off-stream water development, fencing, grazing plan	Apprx 2 miles upstream of NV Ck	Habitat enhancement; Sediment/temperature nutrient reduction	Private	Fencing started in 2004; Other activities being implemented by landowner	Yes - Moderate
	Irrigation diversion improvement	Downstream end of previous project	Reduce sediment loading; remove fish barrier	Private	In negotiations with landowner	Yes - Moderate
Cottonwood Creek	None identified at this time					Yes - Low
McElwain Creek	None identified at this time					Yes - High
Yourname Creek	None identified at this time					Yes – Moderate
Frazier Creek	None identified at this time					Yes - Low

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Project List?
Wales Creek	Potential restoration project(s) proposed on Wales Spring Ck by MDFWP					Yes - Moderate
Ward Creek	Riparian enhancement/grazing management/offsite watering		Improve habitat; Sediment/temperature reduction/, increase instream flow	Private	Implementation in 2005	Yes - Low
Rock Creek	Riparian revegetation	South Fork Rock Creek, middle and lower reaches	Temperature reduction, bank stability, cover, habitat improvements	Private	Completed in 2005	Yes - High
	Riparian revegetation	Upper reach from Salmon and Dry Creek confluence to State lands	Re-establish riparian willow and shrub communities	Private	Ongoing	Yes - High
Kleinschmidt Creek	Riparian enhancement/grazing management/offsite watering	Upper, middle, and lower reaches	Improve habitat; Sediment/temperature reduction/increase instream flow	Private	Implementation in 2005	Yes – High
Warren Creek	Riparian enhancement/grazing management/offsite watering		Improve habitat; Sediment/temperature reduction/increase instream flow	Private	Implementation in 2005	Yes - High
Monture Creek	Grazing management: off-stream water development, fencing, grazing plan development	From 0.5 to 1.5 miles upstream of confluence with BFR	Improve habitat; Sediment reduction	Private	Implementation in 2005	Yes - High
Blanchard Creek	None identified at this time					Yes - High
Buck Creek	None identified at this time					No
Deer Creek	None identified at this time					No
West Fork Clearwater River	None identified at this time					No
Richmond Creek	None identified at this time					No
Blackfoot River (Nevada Creek to Monture Creek)	None identified at this time					Yes
Blackfoot River (Monture Creek to Clearwater River)	None identified at this time					Yes

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Project List?
LOWER BLACKFOOT PLANNING AREA						
Belmont Creek	None identified at this time					
Blackfoot River (Clearwater River to Belmont Cr)	Irrigation Water Management-wheel lines to pivot	BFR immediately below confluence with Clearwater R	Increase mainstem flows	Private	In progress	Listed (mod) but not for restoration
Blackfoot River (Belmont Cr to mouth)	None identified at this time					
Camas Creek	Riparian Planting	Below Ashby Creek confluence to confluence with Arkansas Creek	Re-establish riparian shrub communities, prevent invasives, and bank stabilization	Private	Planning stage 2005	Yes - Low
Day Gulch	None identified at this time					No
East Fork Ashby Creek	None identified at this time					No
Elk Creek (headwaters to Stinkwater Cr)	Grazing Management, some channel reconstruction/stabilization, Irrigation water management	Lower 4 to 5 miles	Improve habitat, water quality, instream flows	Private	In negotiation stage with landowner	Yes-High
Elk Creek (Stinkwater Cr to mouth)	None identified at this time					Yes - High
Keno Creek	None identified at this time					No
Union Creek	None identified at this time					Yes - Moderate
Washoe Creek	None identified at this time					Yes - Low
West Fork Ashby Creek	None identified at this time					No
303(d) Tributary Project Streams						
Hoyt Creek (tributary to Monture Creek	Stream restoration and reconstruction (5,300 ft)	Middle reach of Hoyt Creek	Restore historic floodplain, habitat improvements	Private	Implementation in 2005	Yes - High
Moose Creek (tributary to Blackfoot River)	Culvert replacement and removal	T14N,R10W, S34 and T13N, R10W, S3	Safe fish passage, improve flood capacity, channel restoration	Public	Implementation in 2005	Yes - Moderate
Sturgeon Creek (tributary to Douglas Creek)	Grazing management- off stream watering, fencing, grazing plan	Upper one mile of Sturgeon Ck	Improve riparian area; Improve downstream water quality	Private	Potential NRCS CRP project – 2005 or 2006	Yes – Moderate

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Project List?
Wasson Creek (tributary to Nevada Spring Creek)	Channel restoration, grazing management, stream crossing replacement	Above confluence w/Nevada Spring Creek	Improve fish passage, habitat, and instream flows	Private	Implementation in 2005	Yes - High

APPENDIX C

DESCRIPTION OF NEAR TERM RESTORATION PROJECTS

APPENDIX C: NEAR-TERM RESTORATION PROJECTS

ARRASTRA CREEK PROJECT

Background: Arrastra Creek is the largest tributary to the Blackfoot River between river mile (rm) 68 and rm 105 and enters the Blackfoot as a second-order tributary near rm 88.8 with an estimated base flow of 10-15 cfs. Arrastra Creek is located in the Blackfoot Headwaters TMDL planning area and is listed as impaired for siltation and other habitat alterations. It is the only known stream to support bull trout reproduction between rm 54 and rm 108, and a 2002-03 telemetry study identified Arrastra Creek as the primary fluvial WSCT spawning stream to the middle Blackfoot River, the genetic composition of which has been tested as genetically pure. In 2002, Montana, Fish Wildlife and Parks identified twin culverts at stream mile 3.3 that were providing a significant barrier to the upstream movement of WSCT, with velocities exceeding seven ft/sec. As outlined in the Final Blackfoot Headwaters TMDL for sediment, replacement of undersized culverts to ensure sediment/flow conveyance is a specific recommendation in this reach of Arrastra Creek.

Project Goal: Eliminate a migration barrier and improve access to six miles of upper Arrastra Creek for westslope cutthroat trout (WSCT) and bull trout and to improve flow and sediment conveyance in this reach of Arrastra Creek.

Project Description: This project involves the replacement of these culverts with a bridge. The project is located in Section 17, T14N, R10W.

Restoration Monitoring Strategy: FWP assessed culvert velocities related to fish passage in 2003. Other parameters relating to TMDL impairments will also be collected as part of a 319 grant.

Partners and Funding Sources: BBCTU, Blackfoot Challenge, Bureau of Reclamation, Northwestern Energy, MDFWP, and DEQ/EPA.

BEARTRAP CREEK PROJECT

Background: Beartrap Creek flows from the continental divide westward to join with Anaconda Creek and form the Blackfoot River. The lower one mile of Beartrap Creek is impacted by past mining activities. Mine waste rock and tailings have been deposited on the floodplain throughout this stream reach, and a mine tailings impoundment constructed within the drainage bottom. This portion of Beartrap Creek lies within the Upper Blackfoot Mining Complex, an historic mining area and the subject of an ongoing mine reclamation program, and is included on the State's 303(d) list with metals listed as the cause of impairment.

The current project addresses water quality impacts from mine waste located along the Beartrap Creek floodplain. Reclamation alternatives are currently being evaluated, and will include some level of mine waste removal and stream channel/riparian restoration, with reclamation work to occur by 2008.

Project Goal: The goal of the Beartrap Creek reclamation project is to remove causes of metals-related water quality impairment in Beartrap Creek resulting from past mining activities.

Project Description: The project is located along the Beartrap Creek drainage bottom in Township 15N, Range 6W, Section 27, from the confluence with Mike Horse Creek downstream to the confluence with Anaconda Creek. Reclamation activities will include removal of mine waste materials that may be contributing metals to Beartrap Creek; establishment of a stable, functioning stream channel, and restoration of the flood plain/riparian area.

Restoration Monitoring Strategy: Project monitoring includes annual surface water sampling conducted four times a year upstream of, within, and downstream of the targeted stream reach. Macroinvertebrate sampling is also conducted once a year downstream of the stream reach. This monitoring is scheduled to continue for the next several years.

Partners and Funding Sources: The Beartrap Creek reclamation project is being conducted and funded by Asarco, Inc.

BLACKFOOT RIVER: HEADWATERS TO LANDERS FORK

Background: The Upper Blackfoot River forms at the confluence of Beartrap Creek and Anaconda Creek and flows approximately 1.5 miles westward into a large riparian wetland area. This portion of the Blackfoot River is impacted by past mining activities. Mine waste rock and tailings have been deposited on the floodplain throughout this stream reach, and the stream channel altered and relocated in places leading to an unstable stream channel configuration. This portion of the Blackfoot River lies within the Upper Blackfoot Mining Complex, an historic mining area and the subject of an ongoing mine reclamation program. The Upper Blackfoot River is included on the State's 303(d) list.

This project addresses water quality impacts from mine waste located along the Upper Blackfoot River floodplain. Reclamation alternatives are currently being evaluated, and will include some level of mine waste removal and stream channel/riparian restoration, with reclamation work to occur by 2008.

Project Goal: The goal of the Upper Blackfoot River reclamation project is to remove causes of metals-related water quality impairment in the adjacent river resulting from past mining activities.

Project Description: The project is located along the upper 1.5 miles of the Blackfoot River in Township 15N, Range 6W, Section 21, from the confluence of Beartrap/Anaconda Creeks, downstream to the confluence with Pass Creek. Reclamation activities will include removal of mine waste materials that may be contributing metals to the Blackfoot River; establishment of a stable, functioning stream channel, and restoration of the flood plain/riparian area.

Restoration Monitoring Strategy: Project monitoring includes annual surface water sampling conducted four times a year upstream of, within, and downstream of the targeted stream reach. Macroinvertebrate sampling is also conducted annually within this stream reach. This monitoring is scheduled to continue for the next several years.

Partners and Funding Sources: The Blackfoot River reclamation project is being conducted and funded by Asarco, Inc.

CHAMBERLAIN CREEK PROJECT

The project is located on private land but provides access to both state and private property. Chamberlain Creek ranks number 44 on BBCTU's prioritization. Currently, two bridges (one on top of the other) cross Chamberlain Creek which constricts the channel and has caused impacts upstream and downstream. Both bridges are unstable, unsuitable for timber harvest activities and are undersized. In a cooperative project with BBCTU, the landowners and DNRC, a new, larger bridge would be installed which would allow for timber harvest and private use, as well as improve stream stability and fish habitat. The new steel structure will be installed utilizing 100 year flood event standards and natural channel design.

Partners and funding sources for this project include the landowner, BBCTU, USFWS and DNRC.

CLEARWATER RIVER PROJECT

Project is located at T14N R14W Section 21. Current flood and wheel-line irrigation practices are taking the majority of flows in the lower Clearwater River at critically low flow periods. The landowner will enter into a cooperative agreement to improve irrigation efficiencies by converting from flood and wheel lines to a center pivot. The landowner will reduce irrigation by 50% when flows in the Blackfoot reach 700 cfs, and stop irrigation when flows reach 600 cfs. The sum of this project is expected to substantially enhance Blackfoot River flows during critical low flow periods over the next 20 years.

Partners and funding sources for this project include the landowner, BBCTU, USFWS, and MT FWP.

COTTONWOOD CREEK PROJECT

The project is located in upper Cottonwood Creek, T16N R14W Section 10, Seeley Lake Ranger District, Lolo National Forest. Cottonwood Creek is ranked number 5 on BBCTU's priority list of streams. An undersized culvert is leading to channel instability, aggredation of bedload upstream, and is a total fish passage barrier. In a cooperative project with the USFS, BBCTU will have the lead on the project. The culvert will be replaced with a bridge, and several hundred feet of stream will be restored along with the placement of several rock weirs or cross vanes for hydrologic stability and fish passage.

Partners and funding sources for this project include BBCTU, USFS, FWP, BOR and USFWS.

HOYT CREEK PROJECT

This project is located at T15N R12W Sections 19, 29, and 30, 1 mile west of Ovando, MT and south of Highway 200. Hoyt Creek is a 1st order spring creek tributary to the Dick Creek and Monture Creek systems and ranks 17th on BBCTU's priority list. Hoyt Creek south of Highway 200 is partially entrenched, straightened, and suffers from a lack of fish habitat and complexity. This project will restore approximately 5,300 ft of E4 stream channel by completely

reconstructing Hoyt Creek to a meandering wet meadow stream at its historic floodplain elevation. Coupled with this project will be 334 acres of wetland enhancement and a 1,629 acre upland/riparian grazing and haying management plan.

Partners and funding sources for this project include the landowner, BBCTU, Blackfoot Challenge, FWP, USFWS, BOR, NRCS and DEQ/EPA.

JACOBSEN SPRING CREEK PROJECT

This project is along the North Fork of the Blackfoot River and south of HWY 200, T14N R12W Sections 1, 11, 12, & 13. The North Fork of the Blackfoot River ranks number 1 on BBCTU's priority list. Jacobsen Spring Creek is a major season long, cold water spring creek tributary to the North Fork of the Blackfoot River. The stream is several miles long, originates from several spring sources on the ranch, and is suffering from a range of issues including over-widening, sedimentation, unrestricted livestock watering, elevated temperatures and loss of flows. Through 2004, season-long stream flows and temperatures were collected on the system, as well as preliminary fisheries investigations and whirling disease inventories performed in preparation for a restoration design. The stream will be restored to a properly functioning E4/5 spring creek and spawning tributary to the North Fork. As much as 3 miles of stream will be restored with several techniques including riparian fencing, off-site water development, revegetation, and channel restoration.

Partners and funding sources for this project include the landowner, MDFWP, BOR, NRCS, USFWS and BBCTU

KLEINSCHMIDT CREEK PROJECT

Background: Kleinschmidt Creek, located on the southern margin of Kleinschmidt Flat, is a spring creek tributary to the North Fork of the Blackfoot River (Figure 3-1). The lower 1.5 miles of Kleinschmidt Creek (downstream of Highway 200) is listed as impaired due to riparian degradation, fish habitat degradation, thermal modifications, other habitat alterations, and arsenic on the 2004 303(d) list (Table 3-1). Grazing, dam construction, hydromodification, and bank destabilization are all sited as sources of impairment.

A major in-stream restoration project was completed on the lower 1.5 miles of Kleinschmidt Creek in 2000. Impairment conditions are also being addressed through ongoing TMDL planning effort in the Middle Blackfoot Planning Area.

Project Goal: The goal of this project is to reduce nutrient, sediment, and thermal impacts and improve fish habitat in Kleinschmidt Creek through grazing management and stream channel restoration.

Project Description: This project will utilize a combination of restoration techniques including riparian fencing, riparian revegetation, off-stream stock water development, grazing management on over 640 acres, and traditional in-stream channel restoration. A rotational grazing management plan is currently being developed by the Blackfoot Challenge and the landowner, although detailed schedules and stocking rates have not yet been determined. Riparian fencing

will be used to establish a healthy riparian corridor extending 20 to 30 feet on either side of the stream. The riparian corridor will be planted with native species following intermittent stream channel restoration along approximately 600 feet of stream.

Restoration Monitoring Strategy: Pre-restoration water quality and macroinvertebrate sampling was completed for the project in November 2004. Post-restoration monitoring will commence upon project completion, most likely in 2005/06. Kleinschmidt Creek is also a long-term temperature, stream flow, whirling disease and fisheries monitoring stream.

Partners and Funding Sources: Landowner, NRCS, FWP, and BBCTU

MONTURE CREEK PROJECT

Background: Monture Creek is included on the 2004 303(d) list as impaired for habitat alteration. Impairment sources include agriculture and grazing-related activities. Extensive in-stream habitat restoration has been completed in the last 12 years on private lands in this drainage. The currently proposed project would further enhance habitat within the drainage (for both fisheries and wildlife), through grazing management and other improvements to promote riparian area vegetation and the health of adjacent uplands.

Project Goal: The goals of this project are to reduce sedimentation and improve riparian habitat through grazing management.

Project Description: Improved livestock management will be attained through enclosure fencing and off-stream stock water development. Approximately four miles of new fencing is proposed to exclude livestock from the stream and riparian zone. Three new wells will be drilled, almost two miles of buried water line installed, and at least nine stock water tanks installed to facilitate animal distribution. These proposed projects will improve habitat conditions over approximately two miles of Monture Creek near the confluence with the Blackfoot River.

Restoration Monitoring Strategy: Pre-project vegetation transects have been established and will be monitored annually or bi-annually to record future changes in the plant community. Stream habitat surveys will also be conducted annually to assess the response to restoration activities. Ongoing FWP monitoring activities include fish population surveys; redd counts, and temperature monitoring.

Partners and Funding Sources: Landowner and NRCS

MOOSE CREEK PROJECT

This project is located Township 14N Range 10W Section 34 sw ¼ and Township 13N Range 10W Section 3 ne ¼. The project will replace the lower culvert in the drainage with one that provides for safe vehicle travel, has the capacity to pass the 100-year event and provides passage for fisheries and other non-fish aquatic species. Replace the lower overflow culvert with one of greater capacity. Remove the upper culvert to reduce flood risk in the drainage and to provide passage for fisheries and other non-aquatic species. Restore the channel to natural configuration at the crossing and stabilize the road. Forest Service personnel will monitor the structure at the

lower site after installation. The structure and stream channel dimensions will be measured after construction the following year and at a minimum after any large flood events that take place in the drainage in following years. Success of this project will be measured by how well the new structure at the lower site continues to mimic the stream channel characteristics over time.

Partners and funding sources for this project include BBCTU and USFS – Lincoln Ranger District.

NEVADA CREEK PROJECT

Background: This Nevada Creek project is located near the confluence of Nevada Creek and Halfway Creek in Section 34, T12N, R9W. Nevada Creek is listed as impaired due to metals, flow alteration, nutrients, habitat alterations, thermal modifications, siltation, and suspended solids. Key elements of the project include stream channel reconstruction/stabilization, grazing management, and riparian vegetation planting.

Project Goal: Project objectives include stream channel and streambank stabilization, and reduction of sediment loading to Nevada Lake. Landowner negotiations have been completed by the Blackfoot Challenge and a preliminary restoration plan is currently being designed. This project includes approximately 1,000 feet of stream corridor.

Project Description: The stream channel reconstruction/stabilization portion of the project will reconstruct about 500 feet of channel. Grazing management includes fencing to control livestock grazing in the riparian areas, off-site stock water development, all included with the development of a grazing plan with the landowner. Riparian planting will also be performed to promote riparian area recovery and streambank stabilization. Plantings will include native rhizomatous grass species and native willow species to promote stability and habitat.

Restoration Monitoring Strategy: Pre-restoration monitoring data includes stream channel physical features survey. Additional pre-restoration data needs include establishment of vegetation monitoring transects. Corresponding post-restoration data will be collected following project completion and site stabilization.

Partners and Funding Sources: Landowner, NRCS, Blackfoot Challenge, and DEQ/EPA

WARD CREEK PROJECT

Background: Ward Creek originates on Arrastra Mountain and is the main tributary to Brown's Lake and Kleinschmidt Lake. Ward Creek is listed on the 1996 and 2002 303(d) list as impaired for flow alterations, other habitat alterations, and siltation. Impairment sources are sited as agriculture and irrigated crop production. Ward Creek is part of the ongoing Kleinschmidt Flats restoration and monitoring effort which has produced four major restoration projects with the cooperation and support of landowners and watershed partners. In addition, impairments on Ward Creek are being addressed through ongoing TMDL planning activities and extension work in the Middle Blackfoot. Ward Creek presently supports a resident brook trout population.

Project Goal: The goals of this project are to reduce sedimentation and stream channel impacts through improvements to riparian habitat, livestock management, and the protection of a large, intact wetland.

Project Description: The project includes a well (60 FT.), frost-free pipeline (1750 ft), off-stream winter watering facilities (4), riparian and wetland fencing (4400 ft), and stream bank stabilization (500ft). The project will require an excavator to shape banks and transplant sod mats/willow clumps along about 500 feet of Ward Creek. Willow sprigs will also be planted on approximately 7000 sq. ft. of bank. Additional equipment will be necessary to lay and bury the frost-free pipelines. Livestock will be excluded from the riparian area and the southern portion of the wetland area. All of these combined efforts will improve livestock management, riparian/stream habitat conditions, lower water temperatures, reduce sedimentation, and improve water quality.

Project Monitoring: Restoration monitoring for the Ward Creek restoration project will include pre- and post-restoration monitoring for water column chemistry, water temperature, and geomorphic surveys. The restoration monitoring program is summarized in Table 1. Biological monitoring, including macroinvertebrate sampling and fish population surveys, is not proposed for Ward Creek due to the low fisheries potential for this segment of the creek, and due to the limited budget available for restoration monitoring.

Water quality monitoring will include sampling at two locations, one immediately upstream and the second immediately downstream of the restoration area. Water samples from each location will be tested for total suspended solids and particulate nutrients (total kjeldahl nitrogen, nitrate plus nitrite as N, ammonia as N, total phosphorous, and ortho-phosphorus). Streamflow will also be measured at each water sampling site.

Geomorphic surveying will include streamside surveys of channel morphology (width to depth ratio, pool frequency, large woody debris density, etc.), Wohlman pebble counts, and riparian area assessments. Geomorphic surveys will be conducted along the entire length of the proposed restoration project.

Pre- and post-restoration data for water temperature will be collected by the Department of Fish, Wildlife and Parks following procedures outlined in the Blackfoot Challenge Project QAPP. Continuous water temperature data will be collected immediately upstream and downstream end of the proposed restoration project in 2005 and 2006.

Partners and Funding Sources: Landowner, BBCTU, USWFS, EPA, and the Blackfoot Challenge

WARREN CREEK PROJECT

Background: Warren Creek originates on Ovando Mountain and flows 12 miles southwest until its junction with the Blackfoot River. Warren Creek is listed on the 1996, 2000, and 2002 303(d) list as impaired for flow and habitat alterations. Irrigation causes the middle section to dewater and riparian clearing, heavy grazing, and straightening have all contributed to the degradation of the stream.

Impairments on Warren Creek are being addressed through restoration efforts on various stream reaches, including the current restoration project on lower Warren Creek, and through TMDL planning efforts in the Middle Blackfoot. This project is supported by landowners that have participated in numerous restoration projects to improve stream and riparian conditions on their property. Warren Creek presently supports low densities of WSCT and resident brook trout.

Project Goal: The goals of this project are to reduce sedimentation and improve riparian habitat conditions through re-vegetation techniques, the development of off-stream watering facilities, and improved livestock management.

Project Description: The project includes a well (150 ft), pipeline (9000 ft), off-stream watering facilities (6), armored water gaps (3), and willow sprigging along stream banks (2000 sq.ft.). Water gaps will be armored to withstand livestock impacts and reduce sediment load to the stream. The development of off-stream watering facilities will enable the landowners to implement/enhance their deferred grazing system and significantly limit livestock access to the stream. The grazing system integrates both the McNally's property and adjacent grazing leases on Plum Creek Timber Co. Lands. The system will improve livestock distribution and range conditions, as well as, offer the landowner more options and flexibility in livestock management.

The pastures below are included in the deferred rotation grazing plan. The actual schedule will be developed with the landowner based on AUM's and pasture type.

Pasture #1 = 24 AUM
Pasture #2 = 32.3 AUM
Pasture #3 = 4.2 AUM
Pasture #4 = 12 AUM
Pasture #5 & #6 = Mothering and spring feeding
Pasture #7 = 5.7 AUM
Pasture #8 = 1 AUM
Pasture #9 = 5.1 AUM
Pasture #10 = 8.4 AUM
Pastures #F2, #11, #12, #13, & #14 = Aftermath grazing and winter feeding.

Pasture N1 = 44.4 AUM
Pasture N2 = 25.8 AUM
Pasture N3 = 54.8 AUM

Project Monitoring: Restoration monitoring for the upper Warren Creek restoration project will include pre- and post-restoration monitoring for macroinvertebrate populations, water column chemistry, water temperature, and geomorphic surveys. The restoration monitoring program is summarized in Table 1.

Macroinvertebrate sampling will occur at one location on the mainstem of Warren Creek in the vicinity of the downstream-most proposed water gap (Section 25, T15N, R12W). Samples will be collected with a Hess sampler following procedures outlined in the May 12, 2004 Big Blackfoot Watershed Water Quality Monitoring Program Quality Assurance Project Plan.

Water quality monitoring will include sampling at three locations for total suspended solids and particulate nutrients (total kjeldahl nitrogen, nitrate plus nitrite as N, ammonia as N, total phosphorous, and ortho-phosphorus). Sampling locations will include the east fork and west fork of Warren Creek above the respective proposed water gaps, and the mainstem downstream of the lower proposed water gap. Streamflow will also be measured at each water sampling site.

Geomorphic surveying will include streamside surveys of channel morphology (width to depth ratio, pool frequency, large woody debris density, etc.), Wohlman pebble counts, and riparian area assessments. Geomorphic surveys will be conducted in the vicinity of the three proposed water gaps; one on the east fork of Warren Creek, one on the west fork, and one on the mainstem immediately downstream of the confluence of the two forks.

Continuous water temperature data will be collected near the mouth of Warren Creek using automated temperature recorders. Although this monitoring location is a considerable distance downstream of the Upper Warren Creek restoration project, the long period of record at this site, dating back to at least 2000, provides a good dataset for comparison to future water quality data.

Partners and Funding Sources: Landowner, NRCS, MDFWP, BBCTU, EPA, and the Blackfoot Challenge.

WASSON CREEK PROJECT

Wasson Creek is a tributary to Nevada Spring Creek near the town of Helmville, MT. Historic land and water uses have significantly altered Wasson Creek channel and aquatic habitat, limiting the sustainability of WSCT in the drainage. Existing water and land uses continue to exert significant destabilizing impacts to the stream system. The goal of this project is to return Wasson Creek to a significant source of WCST recruitment to Nevada Spring Creek, Nevada Creek, and the Blackfoot River and provide sufficient forage production for economic sustainability to ranchlands, while demonstrating a successful collaborative effort. This project will utilize a variety of restoration activities including grazing management, irrigation management, fish passage and loss prevention at diversions, new channel construction, new floodplain in straightened reaches, floodplain containment, channel clearing, stream crossing structure replacement, and an in-stream flow lease. Monitoring of this project will include water chemistry samples, substrate, riparian surveys, geomorphic assessments, water temperature, flow, and fish population surveys.

Partners and funding sources for this project include two private landowners, FWP, BBCTU, Blackfoot Challenge, USFWS, Western Water Project, and EPA.

MID-TERM PROJECTS WITH FUNDING NEEDS

NEVADA CREEK PROJECT

Background: This Nevada Creek project includes approximately one mile of stream starting extending from one mile to two miles downstream of the Nevada Lake dam in Section 10, T12N, R10W. Nevada Creek is listed as impaired due to metals, flow alteration, nutrients, habitat alterations, thermal modifications, siltation, and suspended solids. Key elements of the project include, grazing management, irrigation water management, and stream channel restoration. The Blackfoot Challenge is currently in negotiation with the landowner. A conceptual design will be completed summer 2005 with implementation occurring once funding is secured.

Project Goal: Project objectives include aquatic habitat restoration, sediment/temperature/ nutrient load reduction, and maintenance of in-stream flows, with the overall goal being improvement of fishery and wildlife habitat.

Project Description: The grazing management portion of the project will include fencing to better control livestock grazing in riparian areas, off-stream stock water development, and development of a long-term grazing plan with the landowner. Irrigation water management will include changing from a high pressure system to a low pressure system, which will reduce water use from the stream. Stream channel restoration will include channel and habitat reconstruction using wood and vegetation, which will promote long-term stability in the system.

Restoration Monitoring Strategy: Pre-restoration monitoring data will include stream physical features and vegetation parameters from permanently located transects. Corresponding post-restoration data will be collected following project completion and site stabilization.

NEVADA CREEK PROJECT

Background: This project is located approximately three miles downstream of Nevada Lake in Section 4, T12N, R10W. This project focuses on mitigating an approximately 1,000-foot long segment of Nevada Creek that abuts the toe of an irrigation ditch berm. If not addressed, the current situation could lead to undercutting of the berm, sediment loading to Nevada Creek, and the potential release of the irrigation ditch water. As currently envisioned, this project would include either relocation or stabilization of the affected portion of the stream channel to prevent future undercutting, and grazing management. This project is in the early landowner negotiation phase. The project is considered a priority TMDL project due to the potential environmental and property damage that could occur with failure of the irrigation ditch.

Project Goal: The goal of this project is to prevent undercutting of the irrigation ditch berm by Nevada Creek, reduce sediment and nutrient loading to the creek, and reduce summertime high water temperatures through streambank stabilization and grazing management.

Project Description: Project details have not yet been developed due to the preliminary nature of this project. If implemented, the project would likely involve either relocating the affected portion of the creek away from the irrigation ditch berm, or, if stream relocation is not feasible due to landowner concerns or other factors, stabilizing the affected stream reach through vegetation plantings and/or limited use of riprap to prevent further undercutting. The stream work would be coupled with grazing management to promote long-term stability of the project.

Restoration Monitoring Strategy: No stream monitoring data or other relevant information is known to exist from this portion of Nevada Creek. Pre-restoration monitoring will likely be required prior to project implementation, and may include stream channel geomorphic surveys, as well as water quality monitoring to assess the affects of grazing management. Pre and post restoration monitoring needs will be determined once a conceptual project design is developed.

APPENDIX D

108 FISHERIES PRIORITY STREAM SUMMARIES

APPENDIX D: SUMMARY OF PRIORITY STREAMS TRIBUTARY DESCRIPTIONS - DESCRIPTIONS FOR EACH OF 108 TRIBUTARIES IN THE BLACKFOOT

HIGH PRIORITY STREAMS

MONTURE CREEK: Priority - High

Monture Creek, a large 4th order tributary to the middle Blackfoot River, originates in a roadless watershed along southern flanks of the Bob Marshall Wilderness. Monture Creek is ~24 miles long, with the lower ~12 miles flowing through private ranch land. Monture Creek, located in the bull trout core area, ranked as a high priority for all criteria. This ranking is due to 1) bull trout spawning, rearing and core area status, 2) presence of fluvial WSCT, 3) a high (multi- species) sport fishery value, 4) high potential to improve water quality in the Blackfoot River, and 5) cooperative lands resulting in a high ranking for the social category. Monture Creek, a primary spawning and rearing stream to the middle Blackfoot River, supports populations of fluvial bull, fluvial WSCT, rainbow trout and brown trout and resident brook trout. Most fisheries impairments for Monture Creek were corrected over the last decade. However, localized impairments in the lower Monture Creek include: 1) localized channel alterations, 2) lack of instream complexity, 3) degraded riparian areas due to excessive livestock access to the stream. Monture Creek first tested positive for whirling disease in 2000 and infections in 2002 were detected at a mean grade of 3.22.

TMDL Issues

Listing history: 1996, 2000, 2002, & 2004
Listed causes of impairment: Habitat alterations, siltation.

Dewatering Issues

Middle Monture Creek between mile 12 and 15 are on the dewatered stream list due to natural losses.

Native Species Issues

Fluvial bull trout spawning stream, proposed critical bull trout habitat, bull trout core area stream, bull trout recovery/recreational conflict area.
Fluvial WSCT spawning
WSCT genetic composition: tested 94% WSCT

Restoration Activities

Past Restoration

Restoration actions began in 1990 on two large ranches encompassing nine miles of stream. Work included riparian fences on critical bull trout spawning sites, developing low-impact grazing, creating off-stream water developments, removing two winter livestock feeding areas, planting woody vegetation and two miles of instream habitat restoration work. Two water conservation projects have been implemented.

Current/Planned Restoration

Monture Creek is a high priority restoration stream. Restoration activities will continue as opportunities are presented.

Monitoring Activities

Past Monitoring

FWP inventoried fish population surveys in 1989 and resurveys sampling sites in 1994, 1998, 2000 and 2002. FWP measured stream temperatures in 1998, 1999 and from 2001-2004 and stream flows in 1989, 2000 and 2004. FWP has conducted annual bull trout redd counts beginning in1989. Fitzgerald (1996) conducted a riparian health survey in 1995. Koopal (1998) conducted a large wood survey in 1998. FWP conducted geomorphic surveys, winter water temperature and McNeil Core samples near a bull trout spawning sites in 2004. FWP began whirling disease monitoring in 1998. FWP conducted whirling disease tests from 1997 through 2003. Telemetry studies beginning in 1995 identified Monture Creek as a critical fluvial bull trout WSCT spawning stream. An ambient water quality survey was completed in 1989 (Ingman et al. 1990).

Ongoing Monitoring

Monitoring of existing fish population survey sites, bull trout redds, water temperatures, and whirling disease are expected to continue.

Planned Future Monitoring

None although grazing pressure on stream banks prone to damage should be monitored.

NORTH FORK BLACKFOOT RIVER: Priority - High

Description

The North Fork Blackfoot River, the largest tributary (4th order) to the Blackfoot River, drains the Seapegoat Wilderness before entering private land at river mile ~17. The North Fork received a high rank on the restoration priority and total rank list due to its 1) bull trout core area status (spawning and rearing), 2) presence of fluvial WSCT, 3) a high (multi-species) sport fishery value and 4) high potential to increase flows in the Blackfoot River. The North Fork also has some potential to improve water quality by reducing sediment and temperature. Along with supporting one of the Blackfoot watersheds largest bull trout spawning populations and fluvial WSCT, the North Fork also supports rainbow trout, brown trout and low densities of resident brook trout. These species inhabit the North Fork at a varying distribution at low to moderate densities. Fisheries impairments are confined to localized areas of middle reaches include: 1) localized channel alterations that lack instream complexity, 2) suppressed riparian vegetation, and 3) instream flow during in critical bull trout migration corridors due to natural dewatering and irrigation. Whirling disease is also present in the lower drainage.

TMDL Issues

Listing history: 1996; in 2000, determined that beneficial uses are fully supporting.
Listed causes of impairment: Habitat alterations, siltation.

Dewatering Issues

The North Fork of the Blackfoot River is on the dewatered stream list between stream mile 6.2-12.0 due to natural losses and irrigation.

Native Species Issues

Proposed bull trout critical habitat, bull trout spawning stream, bull trout core area, bull trout recovery/recreational conflict area.

Fluvial WSCT migration corridor

Restoration Activities

Past Restoration

Restoration on the North Fork has involved working with irrigators. Projects involve screening five irrigation canals to prevent fish losses, nine miles of stream under improved riparian grazing systems, and streambank stabilization at two locations to protect infrastructure related to diversions and fish screens. One diversion point has been moved and a ditch retired resulting in enhanced flows.

Current/Planned Restoration

Instream flow enhancement project are being considered with several irrigators.

Monitoring Activities

Past Monitoring

FWP inventoried fish population in 1989 and re-surveyed sample sites in 1994, 1998, 2000 and 2002. Bull trout redd counts began in 1989. The USGS has a flow monitoring station (#12338300) near the mouth with six years of continuous data. The USFS periodically collects flow data near the FS boundary and the DNRC collected flow data at Ryan Bridge. FWP monitored water temperatures near mouth from 1998 through 2004. FWP began testing for whirling disease in 1996. The DNRC completed a hydrologic analysis of ground and surface water in 2001 (Roberts, 2001). FWP tested for whirling disease from 1997-2004. Telemetry identified this stream as a fluvial WSCT migration corridor, summering and wintering area. An ambient water quality survey was completed in 1989 (Ingman et al. 1990).

Ongoing Monitoring

Ongoing monitoring includes periodic fish population surveys at established sites, annual bull trout redd counts, continued water temperature and whirling disease monitoring. DNRC and BBCTU ground and surface water monitoring.

Planned Future Monitoring

None beyond ongoing monitoring.

LANDERS FORK: Priority - High

Description

The Landers Fork, a 4th order stream and major tributary to the upper Blackfoot River, originates in the Scapegoat Wilderness and flows ~ 28 miles. The upper ~16 miles are entirely public (National Forest) land with mixed ownership in lower stream reaches. At mile 7.2 Silver King Falls creates a natural barrier to upstream fish movements. The Landers Fork watershed support genetically unaltered WSCT throughout the watershed. Upstream of Silver King Falls, a population of Yellowstone cutthroat trout is also established in Big Horn Lake, which may put the WSCT genetic status of the upper drainage at risk. Below Silver King Falls, the Landers Fork supports fluvial bull trout, fluvial WSCT along with very low densities of brown trout and brook trout. The Landers Fork received the highest total rank

due to its bull trout core area status, high native species value, high (multi-species) sport fishery value to the Blackfoot River, potential to increase flow in the Blackfoot and potential to improve water quality in the Blackfoot River. Fisheries impairments in the lower seven miles include: 1) localized channel alterations, 2) lack of instream complexity due in part to channel clearing activities and flood events, 3) riparian vegetation suppression, and 4) instream flow problems, which appear to partially result from over-widened channels. Over-widened channels contribute to elevated water temperatures upstream of Copper Creek.

TMDL Issues
Not listed

Dewatering Issues
Natural dewatering occurs in approximately one mile of stream near the mouth of Copper Creek.

Native species Issues
Bull trout core area stream, proposed critical bull trout habitat, critical migration corridor
Fluvial WSCT spawning stream
WSCT genetic composition: tested 100% WSCT above and below Silver King Falls

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish populations in 1989 and re-surveyed sample sites in 1999, measured stream temperatures in 1998, 1999, 2001, 2002 and 2004 and stream flows in 1989 and 2000. In October 2000, FWP conducted a habitat survey with an emphasis on pool size and frequency, LWD abundance and function and geomorphic data including bankfull measurements and pebble counts. FWP conducted whirling disease tests in 1997. Telemetry identified this stream as a fluvial WSCT spawning stream. An ambient water quality survey was completed in 1989 (Ingman et al. 1990).
Ongoing Monitoring
Periodic fish population and water temperature measurement are ongoing.
Planned Future Monitoring
None beyond periodic monitoring.

POORMAN CREEK: Priority - High
Description
Poorman Creek, a 3rd order tributary to the upper Blackfoot River, flows ~14 miles through public land (National Forest) in upper reaches and private ranch land in mid to lower reaches. Poorman Creek ranks high on the restoration priority and total rank list due to high native species and biological values. High biological ranks are the result from bull trout spawning

and rearing, presence of fluvial WSCT and a multi-species sport fishery value. Poorman Creek also has potential to increase flows, and ranks high in potential to improve water quality in the Blackfoot River. Poorman Creek supports populations of bull trout, fluvial WSCT, brown trout and resident brook trout. Low numbers of bull trout use the upper reaches including the South Fork for spawning and rearing. WSCT and brook trout are found in low densities in the middle to upper reaches of Poorman Creek, while brown trout are found in low numbers in the lower and middle reaches. Fisheries impairments located primarily in the lower reaches include: 1) channel alterations related to placer mining, 2) road crossings, fords and sediment delivery, 3) irrigation impacts (fish entrainment and fish passage), 4) excessive livestock grazing impacts to riparian vegetation resulting and stream bank degradation, and 5) dewatering resulting from natural losses and irrigation.

TMDL Issues

Listing history: 1996, 2000, 2002, & 2004

Listed causes of impairment: Dewatering, flow alteration, metals, other habitat alterations, riparian degradation, and siltation.

Dewatering Issues

The lower two miles of Poorman Creek is on the dewatered stream list due to natural losses and irrigation. In 2002, a project to enhance flows during the high flows was undertaken in order to improve native fish migrations. The project involved a flood-to-sprinkler irrigation conversion. The project includes enhanced flows at the upper portion of the intermittent reach.

Native Species Issues

Bull trout spawning stream

WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

Restoration projects near the mouth focus on high flow instream flow enhancement project and are still in the implementation phases. This project involved a flood to sprinkler conversion designed to 1) improve migrations of WSCT, 2) enhance summer flows in the naturally dewatered section and 3) prevents fish losses of fish to irrigation ditches. The project also involved the construction of three bridges and the removal of two culverts. Fencing, off-stream water developments are other components to the project are under construction. Upstream projects involve culvert replacements with structures suitable to pass fish. The USFS plans restoration work in the upper tributaries of the drainage.

Current/Planned Restoration

Shrub plantings and livestock measurement measures are planned near the mouth. Addition road crossings are planned in upper Poorman Creek.

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1989, 1991, 1999, 2001, 2003 and 2004 and measured stream temperatures in 1999-2003 and stream flows in 1989, 2000, 2001 and 2003.

FWP tested for whirling disease in 2004. USFS has conducted McNeil Core sampling in Poorman Creek over a number of years. USFS also conducted fisheries surveys in 1995 and 1996 for inclusion in the Poorman EIS, as was a basin-wide road sediment and culvert survey.

Ongoing Monitoring

Ongoing monitoring includes fish population and instream flow monitoring in the lower portion of Poorman Creek.

Planned Future Monitoring

None beyond ongoing monitoring.

COTTONWOOD CREEK (rm 43): Priority - High

Description

Cottonwood Creek, a major, a 3rd order tributary to the middle Blackfoot River, flows ~16 miles through National Forest in upper reaches and mixed State and private lands in the lower ~12 miles. Cottonwood Creek ranks high on the restoration priority list for total and biological rank, including high native species and sport fishery values. These high rankings result primarily for the status as a bull trout core area and fluvial WSCT stream, and multi-species assemblage (rainbow and brown trout) in lower stream reaches. It has low potential water quality benefits with some potential for sediment reduction. Cottonwood Creek also has potential to increase downstream flows to the Blackfoot River. Low densities of rainbow and brown trout inhabit the lower reaches while moderate numbers of brown and brook trout dominate the middle reaches. Moderate densities of WSCT and with low numbers of bull trout dominate the upper reaches. Principle fisheries impairments, located in the middle and lower reaches, include: 1) lack of complex fish habitat (instream wood); 2) livestock induced stream bank degradation, 3) riparian vegetation suppression, and 4) whirling disease. Whirling disease was first detected in Cottonwood Creek in 1998. In 2002, whirling disease levels were detected at a mean grade of 4.5.

TMDL Issues

Listing history: 1996; in 2000, determined that all beneficial uses are fully supporting
Listed causes of impairment: Flow and habitat alterations, siltation.

Dewatering Issues

The middle reach of Cottonwood Creek (mile 4.4 –10.0) is on the dewatered stream lists due to natural losses and irrigation.

Native Species Issues

Bull trout core area, proposed critical habitat
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

Some restoration work has been completed in lower Cottonwood Creek. The work involves riparian grazing improvements and fish friendly irrigation upgrades (fish screens and fish ladders) at two locations. A water lease was implemented in 1997 to improve fish passage in

native fish migration corridors. In 2003, an open ditch in lower Cottonwood Creek was shut down with the conversion of a flood to sprinkler irrigation.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 1989, 1991-92 and conducted annual fish population survey in the headwaters at a water-lease monitoring site between 1997-2004. FWP monitored stream temperatures in 1997, 1999 and 2001-2004 and stream flows in 1989, 2000 and 2003. Bull trout redd surveys have been attempted but low number of spawners has limited biologists ability to identify primary spawning sites. Whirling disease was first detected in Cottonwood Creek in 1995. A graduate student completed whirling disease research related *t. tubifex*, channel features and whirling disease. Whirling disease sampling continued in 1997-1999 and 2002. An ambient water quality survey was completed in 1989 (Ingman et al. 1990).

Ongoing Monitoring

FWP ongoing monitoring involves annual fish population surveys and diversion withdrawal in the area influenced by water leases. Whirling disease monitoring is periodic and water temperatures are monitoring on an annual basis.

Planned Future Monitoring

In the next few years, FWP plans to resurvey several fish population monitoring sites established in the early 1990s.

DICK CREEK: Priority - High

Description

Dick Creek, a 2nd order tributary to lower Monture Creek, flows ~14 miles through both public (National Forest, State) and private agricultural and industrial forest (Plum Creek) lands. Dick Creek ranks high on the restoration priority list. Although located in a bull trout core area, Dick Creek does not support bull trout spawning and rearing. Its high native species rank results from the presence of fluvial WSCT and a multi-species sports fishery value to the Blackfoot River. It has the potential to increase flow, and ranks high in water quality benefits to Blackfoot River. Dick Creek supports populations of fluvial WSCT, rainbow trout, brown trout, and resident brook trout. Moderate densities of rainbow trout dominate its lower reaches along with brown trout and low densities of brook trout. Dick Creek's headwaters support WSCT and brook trout in moderate densities. Fisheries impairments include: 1) livestock induced stream bank degradation and riparian vegetation suppression, 2) lack of complex fish habitat (instream wood), 3) irrigation impacts (fish entrainment), 4) instream flow (low flow from irrigation withdraws and natural causes), 5) road crossing (culverts limiting fish passage).

TMDL Issues

Not listed

Dewatering Issues

The middle reach of Dick Creek (mile 3.5-6.0) is on dewatered stream list due to natural losses and irrigation.

Native Species Issues

Bull trout core area stream
Isolet WSCT population
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

Dick Creek has substantial amount of restoration work completed, involving channel and wetland restoration and grazing improvements.

Current/Planned Restoration

A turbulent fountain fish screen is to be installed in 2005.

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 1992 and 2001 and measured water temperatures in 1997, 1999 and 2001.

Ongoing Monitoring

None

Planned Future Monitoring

None

BEAVER CREEK: Priority - High

Description

Beaver Creek, a 3rd order tributary to Keep Cool Creek located near Lincoln, flows ~ 9 miles through both public and private land. The private land is located in the lower three miles of stream. Beaver Creek ranks high for total and biological rank. Supporting very limited bull trout rearing and fluvial WSCT, Beaver Creek ranks high for native species value. In addition to providing a high multi-species sport fishery value, Beaver Creek also ranks high in both 1) potential water quality benefits, and 2) potential to increase flows to the Blackfoot River. Beaver Creek supports high densities of WSCT in headwaters along with brown trout and resident brook trout in lower reaches. Brown trout are dominant at increased densities in lower reaches. Fisheries impairments, located in the middle reaches include: 1) reduced instream flow from irrigation, 2) fish entrapment to irrigation canals, and 3) livestock induced stream bank damage, and 4) riparian vegetation suppression from livestock grazing and an instream corral.

TMDL Issues

Not listed

Dewatering Issues

Although irrigation occurs in the middle portion of Beaver Creek, the level of dewatering and fisheries impacts have not yet been evaluated.

Native Species Issues
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

Improvements on Beaver Creek include fish-friendly diversions and riparian grazing changes. The USFS has implemented several projects including drain dip construction and gravelling, were completed to reduce sediment delivery to Beaver Creek and tributaries to Beaver Creek. A baffle to provide fish passage has been installed on the Yukon Creek crossing of Beaver Creek road.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish population surveys in 1989 and resurveys sites in 1999 and 2004 and measured stream temperatures in 1999, and 2001-04. FWP tested for whirling disease in Beaver Creek in 2004, the results of which are pending. The USFS conducts periodic McNeil core samples and most recently tributary fish surveys were completed in 2002 as part of the Copper/Stonewall watershed analysis. Bull trout were documented in Theodore Creek in the mid 1980's, however no bull trout were found in the 2002 fish surveys.

Ongoing Monitoring

None

Planned Future Monitoring

Periodic fish sampling and water temperature measurements are expected to continue.

BELMONT CREEK: Priority - High

Description

Belmont Creek, a large 2nd order tributary to the lower Blackfoot River, flows ~11 miles through public and private land-primarily industrial (Plum Creek) forest. The lower ~10 miles of stream are Plum Creek properties, except for a BLM section near the mouth. Past fisheries-related projects include a Plum Creek-sponsored basin-wide erosion control (road drainage) measures, along with fish passage improvements near the mouth. As a bull trout core area and fluvial WSCT stream, Belmont Creek ranks high on the restoration priority list for total rank, biological rank, and native species rank. In addition to native species, Belmont Creek supports rainbow and brown in lower reaches and very low brook trout densities. This species assemblage provides for high (multi-species) sport fishery value to the Blackfoot River. With only one of three water quality impairments (sediment), Belmont Creek ranked as a low priority for potential water quality improvements. Fisheries-related impairments include elevated levels of instream sediment (road drainage, riparian livestock access), along with areas of low habitat complexity in lower Belmont Creek. Whirling disease was detected in Belmont Creek in 2003 at a low grade (mean grade 0.38).

TMDL Issues

Listing history: 1996, 2000, 2002, & 2004

Listed causes of impairment: Habitat alterations and siltation.

Dewatering Issues
None

Native Species Issues
Bull trout core area stream, proposed critical bull trout habitat, bull trout spawning stream
Fluvial WSCT spawning
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

Twin culverts that seasonally restricted upstream fish movements were replaced in 1990. Plum Creek Timber Company has initiated a sediment control project. The BLM has recently completed some habitat enhancement and grazing modifications in lower Belmont Creek.

Current/Planned Restoration Activities

None

Monitoring Activities

Past Monitoring

FWP inventoried fish population surveys in 1989 and resurveyed some sites in 1994, 1997, 1998 and 2001, measured stream temperature in 1997-1999 and 2001-2004 and stream flows in 1989 and 2000. FWP tested for whirling disease from 2000 through 2004. Telemetry identified this stream as supporting fluvial WSCT spawning. An ambient water quality survey was completed in 1989 (Ingman et al. 1990).

Ongoing Monitoring

Annual summer water temperatures are expected to continue.

Planned Future Monitoring

Period fish population and whirling disease monitoring will continue.

ROCK CREEK: Priority - High

Description

Rock Creek, the largest tributary to the lower North Fork Blackfoot River, is a 2nd order stream that flows 8.2 miles through public (State) and private ranch land. State land is only found in the upper reaches of the stream. Rock Creek ranks high on the restoration priority and total rank list due to: 1) bull trout core area status, and bull trout rearing, 2) fluvial WSCT presence, 3) high (multi-species) sport fishery value, 4) potential to increase flow in the Blackfoot River, and 5) high potential to improve downstream water quality. Rock Creek ranked low for social and financial considerations. Rock Creek contains some rearing of bull trout, fluvial WSCT, brown trout, rainbow trout and resident brook trout. Many of the fisheries impairments were addressed over the last decade. Current fisheries impairments, concentrated in middle reach of Rock Creek drainage, include 1) dewatering, entrainment, fish passage problems related to irrigation, 2) lack of instream complexity, 3) heavily degraded riparian vegetation resulting from excessive livestock access to stream banks. Whirling disease approaching lethal levels is now present at in the watershed.

TMDL Issues
Listing history: 1996, 2000, 2002, & 2004
Listed causes of impairment: Habitat and flow alterations, siltation.

Dewatering Issues
Rock Creek is on dewatered stream list between stream mile 1.4-7.0 due to both natural losses and irrigation.

Native Species Issues
Bull trout core area stream
Fluvial WSCT migration corridor

Restoration Activities

Past Restoration

Rock Creek has been the focus of restoration over its entire 8.2-mile length since the early 1990s. Restoration actions include channel and floodplain reconstruction, grazing management, shrub plantings, culvert replacements and instream flow enhancement using a flood to sprinkler conversion.

Current/Planned Restoration

Restoration focusing on shrub planting and floodplain construction will continue through 2005.

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1989, 1990, 1994, 1996, 1998, 1999, 2001, and 2002-2004. FWP completed habitat surveys in 1990 on the lower 1.4 miles of stream (Pierce 1991), and then surveyed the remaining 6.8 miles of Rock Creek in 1998 (Koopal 1999). FWP measured stream flows in 1989 and 2002 and water temperatures in 1998, 1999 and 2002. Whirling disease monitoring has occurred in 1999-2001 and 2003.

Ongoing Monitoring

Ongoing monitoring includes continued fish population monitoring in lower Rock Creek, and periodic sampling of other sites. Periodic stream temperature and whirling disease monitoring is expected to be ongoing.

Planned Future Monitoring

In addition to ongoing monitoring, upon completion of all Rock Creek projects, post-project habitat and fish population will likely be undertaken.

GOLD CREEK, West Fork: Priority - High

Description

West Fork Gold Creek is a 2nd order tributary stream to Gold Creek in the lower Blackfoot watershed. Its headwaters begin at Bull Lake and flow 8.0 miles through both public (National Forest) and private industrial (Plum Creek) forestlands. West Fork Gold Creek ranks high in total ranking on the restoration priority list, due to its high native species value and multi-species sport fishery value to the Blackfoot River. It also ranks high in social and financial considerations. As a result of its generally high water quality, West Fork of Gold

Creek ranks low for providing potential downstream water quality benefits. Because the West Fork does not provide irrigation there is no potential for improving downstream flows to the Blackfoot River. A bull trout core stream. West Fork Gold Creek supports bull trout spawning and rearing. The lower reaches of the West Fork support low numbers of fluvial WSCT, juvenile bull trout, rainbow trout, brown trout and resident brook trout. Fisheries impairments include road drainage problems.

TMDL Issues
Not listed

Dewatering Issues
None

Native Species Issues
Bull trout core area, proposed critical bull trout habitat
WSCT genetic composition: untested

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish populations in 2000.
Ongoing Monitoring
None
Planned Future Monitoring
None

KLEINSCHMIDT CREEK: Priority - High

Description
Kleinschmidt Creek, a 1st order spring creek tributary to Rock Creek (North Fork watershed), drains the southern portion of Kleinschmidt Flat. This stream flows ~2.6 miles mostly through private land. Kleinschmidt Creek has been the focus of an extensive channel reconstruction and restoration project and is now in early recovery stage. Kleinschmidt Creek ranks high for project streams for all criteria. These high ranks are the result of bull trout core area status, bull trout rearing, and use by fluvial WSCT and multi species sport fishery values. Despite extensive restoration, Kleinschmidt Creek has potential for further water quality improvement with modified riparian grazing practices in upper reaches. Kleinschmidt Creek received a high social rank. Kleinschmidt Creek supports very low densities of juvenile bull trout and fluvial WSCT along with higher densities of brook trout and brown trout. Fisheries impairments limited to upper Kleinschmidt Creek include 1) lack of riparian vegetation, 2) excessive livestock access to the riparian area and 3) feedlot runoff. Kleinschmidt Creek support a high level of whirling disease.

TMDL Issues

Listing history: 2000, 2002, & 2004

Listed causes of impairment: metals (copper), thermal modification, fish habitat degradation, other habitat alterations, and riparian degradation.

Dewatering Issues

None in lower spring-fed portion of Kleinschmidt Creek.

Native Species Issues

Bull trout core area

No evidence of WSCT reproduction

Restoration Activities

Past Restoration

Complete channel reconstruction of the lower 1.5 miles of stream ending in 2001 Restoration objectives including reducing whirling disease infection levels, restoring stream channel morphology for all life stages of trout, increasing recruitment of trout to the Blackfoot River, and restoring thermal refugia and rearing areas for North Fork bull trout. Restoration activities included decreasing the width to depth ratio, restoring channel sinuosity, creation of pools, addition of woody debris and other natural materials to the channel, shrub plantings along streambank, creation of riparian wetlands, and livestock fencing.

Current/Planned Restoration

Grazing management changes are planned for the upper reach Kleinschmidt Creek.

Monitoring Activities

Past Monitoring

FWP assessed habitat in 1990 and 2002, surveyed fish populations beginning in 1990 and periodically through 2004. FWP measures stream temperatures in 1998, 1999 and 2001-2004. FWP conducted whirling disease testing between 1997 and 2003.

Ongoing Monitoring

FWP plans to continue fish population, water temperature and whirling disease studies into the next few years.

Planned Future Activities

Planned monitoring associated with 2005 restoration program included macroinvertebrate sampling, water quality sampling (nutrients, TSS), water temperature monitoring, and habitat/geomorphic/riparian assessments. Periodic fish population surveys will likely continue.

DUNHAM CREEK: Priority - High

Description

Dunham Creek, a large 2nd order tributary to Monture Creek, flows ~13 miles through public land (National Forest) and a small portion of private land near the mouth. Dunham Creek ranks high on the restoration priority list for project streams. Supporting fluvial bull trout spawning and rearing and fluvial WSCT, Dunham Creek ranks high in native species and multi-species sport fishery values. Because of existing high water quality, Dunham Creek

has low potential water quality benefits. Dunham Creek supports populations of fluvial bull trout, fluvial WSCT, and resident brook trout. Fish densities for both WSCT and bull trout decline in the middles reaches. Fisheries impairments, located in the middle and lower reaches, include the loss of riparian vegetation related to past logging practices. Dunham Creek is also site of an extensive channel reconstruction, habitat restoration and revegetation project. Dunham Creek is in the early stages of project recovery.

TMDL Issues

Not listed; tributary to Monture Creek a 303(d) listed stream.

Dewatering Issues

The lower five miles of Dunham Creek are on dewatered stream list due to natural losses and some irrigation within the natural losing reach.

Native Species Issues

Bull trout core area, proposed critical bull trout habitat, bull trout spawning
Fluvial WSCT spawning
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

In 1996, the Dunham ditch was screened to prevent fish losses to the ditch. The diversion was then upgraded to better allow upstream low flow fish passage in 2003-04.

In the 1970's over a mile of Dunham Creek was channelized. In 2001, the Blackfoot cooperators reconstructed this stream section to natural channel dimensions, which include restoring features to a reference condition and aggressive revegetation. The project involved correcting sediment deliveries estimated at ~25-times natural levels. This influx of unnaturally high levels of sediment entered the channel immediately upstream of the Dunham Creek bull trout spawning area.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

Beginning in 1995, telemetry identified this stream as a fluvial bull trout and WSCT spawning stream, and identified the Dunham diversion as a native fish entrainment problem. FWP conducted fish population surveys in 1996, 1998, and 2000-2004 and began bull trout redd counts in 2002. FWP performed geomorphic, McNeil core and winter water temperature data collections in fall of 2004 in a section of the restored reach used by spawning bull trout. FWP observed bull trout redds in project area in 2002 and 2004.

Ongoing Monitoring

Fish population surveys in the reach affected by restoration activities.

Planned Future Monitoring

None beyond ongoing monitoring.

GOLD CREEK: Priority - High

Description

Gold Creek, a large 3rd order tributary to the lower Blackfoot River, flows ~19 miles through public (National Forest, BLM) and private industrial forest (Plum Creek) land. Gold Creek ranks high on the restoration priority list. As a core area bull trout stream, Gold Creek provides spawning and rearing of fluvial bull trout. Gold Creek also supports fluvial WSCT and rainbow trout and brown trout in lower reaches along with resident brook trout. Gold Creek ranks high in native species value and provides high (multi-species) sport fishery value. Because of generally high water quality, Gold Creek ranked low for potential water quality benefits. Gold Creek provides no irrigation and thus no potential to improve downstream flows to the Blackfoot River. Fisheries impairments include: 1) road drainage problems, 2) recreational impacts (access sites in bull trout spawning areas) and 3) low whirling disease infection. Gold Creek tested positive for whirling disease with a very low grade in 1999 and tests since have been negative.

TMDL Issues

Not listed

Dewatering Issues

None

Native Species Issues

Bull trout core area, proposed critical bull trout habitat, bull trout spawning, bull trout recovery/recreational conflict area

Fluvial WSCT spawning

WSCT genetic composition: tested 99% WSCT

Restoration Activities

Past Restoration

Past harvest of riparian conifers combined with the actual removal of large woody debris from the channel has reduced habitat complexity in the lower three miles of Gold Creek. Before 1996, pools accounted for less than 1% of the wetted surface area in this section of stream (Pierce 1990). Low densities of age 1+ fish, including native fish, resulted from this habitat simplification. In 1996, the Blackfoot cooperators installed 66 habitat structures made of native material (rock and wood) that resulted in 61 new pools in the 3-mile section.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 1989, and monitored fish population response related to a habitat enhancement project between 1996 and 2003. A journal paper was also published relating the survival of habitat structures to a flood event (Schmetterling and Pierce 1999). FWP measured stream temperatures between 1999 and 2004 and stream flows in 1989 and 2000. Whirling disease testing was conducted in 1997, 1999-2000 and 2002. Telemetry

identified this stream as a fluvial WSCT spawning stream. An ambient water quality survey was completed in 1989 (Ingman et al. 1990).

Ongoing Monitoring

Periodic fish population. water temperature and whirling disease sampling are ongoing.

Planned Future Monitoring

None beyond periodic/ongoing monitoring.

SNOWBANK CREEK: Priority - High

Description

Snowbank Creek is a 1st order tributary stream to Copper Creek, an important spawning and rearing stream for WSCT and fluvial bull trout in the upper Blackfoot River watershed. Snowbank Creek's headwaters begin on the eastern slope of Stonewall Mountain then flow northeast 4.4 miles through the Helena National Forest before entering Copper Creek at mile 5.9. Snowbank Creek ranks high in the total ranking due to high native species value, including bull trout core area and rearing present, high social and financial rank and ability potential to provide increased flows to the Blackfoot River. Human-related fisheries impairments involve a defunct diversion structure. Impairments are: 1) fish entrainment to Snowbank Lake, 2) reduced fish passage, 3) stream channel dewatering below the diversion, 4) localized channel alterations in the area of the diversion, and 5) a road crossing identified as a partial fish passage barrier.

TMDL Issues

Not listed

Dewatering Issues

The lower 0.4 miles of Snowbank Creek is on the dewatered stream list due to a diversion to Snowbank Lake, which diverts a majority of the Snowbank Creek base to Snowbank Lake.

Native Species Issues

Bull trout core area stream
WSCT genetic composition: untested

Restoration Activities

Past Restoration

None

Current/Planned Restoration

The existing diversion to Snowbank Lake results in several fisheries problems. In addition, the water diverted for the stream has no legal water right. Planning to correct these problems is ongoing. Wildfire-related restoration work including cross-drainage improvements on roads and upsized culvert replacements are planned for 2005.

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 2003 and 2004 and measured stream and ditch flows in 2003. Initial McNeil core sampling of cutthroat spawning gravels has been conducted by the USFS and several more years of sampling is planned.

Ongoing Monitoring

Flow and fish population monitoring is expected to continue.

Planned Future Monitoring

Monitoring and planning is ongoing.

BLANCHARD CREEK: Priority - High

Description

Blanchard Creek, a 2nd order tributary to the lower Clearwater River, flows ~13 miles through industrial (Plum Creek) forest, along with State land and private agricultural properties in lower reaches. Blanchard Creek ranks high for both total and biological rank, based largely on its potential for instream flow and water quality benefits. Because Blanchard Creek supports fluvial WSCT but no bull trout, it ranks moderate in native species value. However, because Blanchard Creek supports high rainbow trout densities and brown trout, it ranks high (multi-species) sport fishery value to both the Clearwater and Blackfoot Rivers. Fisheries-related impairments - located primarily in lower Blanchard Creek include 1) dewatering, 2) channel alterations, 3) road drainage problems, 4) livestock induced stream bank degradation and 5) riparian vegetation suppression.

TMDL Issues

Listing history: 1996, 2000, 2002, & 2004

Listed causes of impairment: Habitat alterations, siltation, and flow alteration.

Dewatering Issues

The lower 1.2 miles of Blanchard Creek is on the dewatering stream list due to irrigation.

Native Species Issues

WSCT genetic composition: tested 78% WSCT

Restoration Activities

Past Restoration

Past restoration involved the installation of diversions with fish ladders and enhancement of flows between 1990 and 2002. Some grazing improvements have been implemented on State lands.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1990, 1992-1995, 1997-2000 and 2002-2003 and measured stream temperatures in 1999 and 2001. An ambient water quality survey was completed in 1989 (Ingman et al. 1990).

Ongoing Monitoring

None

Planned Future Monitoring

Periodic fish population sampling will likely continue.

COPPER CREEK: Priority - High

Description

Copper Creek, a large 3rd order tributary to the Landers Fork in the upper Blackfoot River watershed, flows ~14 miles entirely through public (National Forest) land, except a small portion of private land in the lower reaches. Copper Creek ranks high on the restoration priority list. With bull trout core area status, fluvial bull trout and genetically pure fluvial WSCT spawning and rearing, it ranks high in native species value and high (multi-species) in sport fishery value to the Blackfoot River. Because of existing high water quality and adequate flows, Copper Creek ranks low in potential water quality benefits to the Blackfoot River. Densities of WSCT and bull trout for both species are generally low throughout the drainage, but increase in middle reaches. Fisheries impairments include stream crossing (fords and undersized bridges) and localized areas of stream bank degradation from recreational users in the middle. Dewatering in Snowbank Creek, a tributary to Copper Creek, may impact instream flows.

TMDL Issues

Not listed

Dewatering Issues

The lower mile of Copper Creek is on the dewatered stream list due to natural dewatering and other areas in the headwaters are naturally intermitted the extent of which is unknown. How flows in Copper Creek are affected by flow reductions in Snowbank Creek is unknown.

Native Species Issues

Bull trout spawning stream, proposed critical habitat, bull trout core area, bull trout recovery/recreational conflict area

Fluvial WSCT spawning

WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

None

Current/Planned Restoration

Potential restoration work identified by the USFS includes the future obliteration of the Red Creek road. Restoration work includes cross drainage improvement, sediment conveyor installation, upsized culvert installation, culvert/bridge replacements and partial graveling of the roads within the basin. Approximately 10 miles of jammer trail reclamation is planned for 2005. A fish passage baffle is planned for installation in the Cotter Creek culvert in 2006. Natural barriers to migration (waterfalls) are located on Red Creek and the unnamed tributary entering in section 2 in the headwaters.

Monitoring Activities

Past Monitoring

FWP inventoried fish population in 1989 and resurveyed sites in 1998-1999, 2002 and 2004. FWP measured water temperatures 1999 and 2001-2004 and stream flows in 1989 and 2000. Annual bull trout redd counts conducted by the USFS began in 1988. The USFS has

collected several years of McNeil core sample data. Telemetry identified this stream as an important fluvial WSCT spawning stream.

Ongoing Monitoring

Bull trout redd counts occur annually in Copper Creek, bull trout spawning site assessments will be completed by 2005. Periodic fish population surveys at established sites are expected to continue.

Planned Future Monitoring

None beyond ongoing/periodic surveys.

WARREN CREEK: Priority - High

Description

Warren Creek, a small 2nd tributary to the middle Blackfoot River, flows ~14 miles primarily through forested foothills and private ranch land. Warren Creek ranks high on the restoration priority and total rank list. This high rank is due to high (multi-species) sport fishery value to the Blackfoot River and high potential to improve downstream flow and water quality. Warren Creek has a moderate native species value. Warren Creek contains a mixed species composition of brook trout, brown trout and low numbers of WSCT. Brook trout inhabit the entire drainage, brown trout are found in the lower reaches and WSCT are present in the lower and upper reaches of Warren Creek. Fisheries impairments, located throughout the drainage, include: 1) road crossings, 2) irrigation dewatering and diversion that inhibit fish passage, 3) channelization, 4) lack of instream complexity, and 5) degraded stream banks and riparian areas due to excessive livestock access. Warren Creek tested positive for whirling disease in 1998.

TMDL Issues

Listing history: 1996, 2000, 2002, & 2004

Listed causes of impairment: Flow and habitat alterations.

Dewatering Issues

The lower six miles of Warren Creek is on the dewatered stream list to irrigation.

Native Species Issues

WSCT genetic composition: untested

No evidence of WSCT reproduction

Restoration Activities

Past Restoration

Warren Creek has been the focus of extensive restoration efforts beginning in 1991.

Projects to date include 1) removal of three streamside corrals, 2) improved fish passage at three locations, 3) three miles of channel reconstruction, 4) six miles of improved riparian grazing, and 5) enhanced stream flows in the lower three miles of stream.

Current/Planned Restoration

Approximately one mile of Warren Creek is currently being reconstructed. Shrub planting and riparian grazing changes will be incorporated.

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1991, 1992, 1997, and 2000-2004 measured stream flows in 2000, stream temperatures in 2000-2004 and conducted whirling disease tests in 1997-2000.

Ongoing Monitoring

Fish population, water temperatures and whirling disease monitoring are expected to continue into the next few years.

Planned Future Monitoring

None, beyond ongoing fish population surveys.

WILLOW CREEK (lower): Priority - High

Description

Willow Creek below Lincoln, a 2nd order tributary to the upper Blackfoot River, flows ~9 miles through public (National Forest) land in the upper drainage and private ranch land downstream of mile ~6. Willow Creek ranks high for restoration priority and total rank, due to: 1) high potential to improve water quality to the Blackfoot River, 2) moderate native species value, 3) high (multi-species) sport fishery value to the Blackfoot River, and 4) potential to increase flows in the Blackfoot River. Willow Creek supports fluvial WSCT, brown trout and resident brook trout. WSCT and brook trout dominate upper reaches. Low densities of brown trout occupy lower Willow Creek. Fisheries impairments include culverts and mining in the upper drainage as well as irrigation dewatering and degraded riparian vegetation from excessive livestock use in the middle and lower reaches.

TMDL Issues

Not listed

Dewatering Issues

The lower two miles of Willow Creek is on the dewatered stream list due to irrigation.

Native Species Issues

WSCT genetic composition: tested 100% pure

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish population in 1992 and 1999, measured stream temperatures in 1999 and from 2001-2003 and stream flows in 2000.

Ongoing Monitoring

None

Planned Future Monitoring

None

ELK CREEK: Priority - High

Description

Elk Creek, a degraded 3rd order tributary to the lower Blackfoot River, flows ~14 miles through both public (BLM and State) in headwaters and private (agricultural) land in lower ~7 miles. It ranks high on the restoration priority list as it has a high potential for improving water quality and downstream flows to the Blackfoot River. Elk Creek provides a high (multi-species) sport fishery value to the Blackfoot River, but ranked moderate in native species value and received a low social and financial ranking. Elk Creek supports populations of fluvial WSCT, rainbow trout, brown trout, and resident brook trout. Densities of all species decrease in the downstream direction. Fisheries impairments in upper Elk Creek include channel alterations (placer mining) and road drainage problems. Fisheries impairments for lower Elk Creek include: 1) lack of complex fish habitat (instream wood), 2) livestock induced stream bank degradation and riparian vegetation suppression, 3) elevated water temperature and channel instability, 4) irrigation impacts (instream flows, fish losses to ditches and fish passage), and 5) adverse effects of upstream mining and road drainage problems. Elk Creek tested positive for whirling disease in 2003 with a mean grade of 2.84.

TMDL Issues

Listing history: 1996, 2000, 2002, & 2004

Listed causes of impairment: Flow alterations, siltation, metals, nutrient, and habitat alterations.

Dewatering Issues

The lower three miles of Elk Creek is on the dewatered stream list due to irritation.

Native Species Issues

WSCT genetic composition: tested 94% WSCT

Restoration Activities

Past Restoration

To begin improving water quality in lower Elk Creek, a major erosion control project was undertaken in a channelized section of lower Elk Creek (mile 1.3-2.9) in 1994. This project included the reconstruction of 8,600' of new channel as well as some livestock management changes. Although this project corrected a major sediment problem, subsequent monitoring of water temperature, fish populations, and suspended sediment all confirm Elk Creek failed to meet intended project benefits. Objectives were not met, as grazing prescriptions were not adhered to. Other grazing plans on adjacent riparian pastures were not implemented.

Current/Planned Restoration

FWP is currently working with the Blackfoot Challenge and NRCS to again develop restoration and grazing plans for the lower four miles of Elk Creek

Monitoring Activities

Past Monitoring

FWP 1) conducted fish population surveys in 1989, 1991, 1995-1997, 2000 and 2003, 2) monitored water temperatures in 1997 and 1999-2003, 3) measured stream discharge in 2000 and 2003, 4) measured total suspended sediment in 2001, 5) performed geomorphic surveys at two locations in 2004, and 6) began monitoring for whirling disease in 1997 and continued in 1999 and 2000-2004. An extensive geomorphic, fish habitat and riparian habitat study was completed over the length of the mainstem (Watershed consulting 1996). An ambient water quality survey was completed in 1989 (Ingman et al. 1990).

Ongoing Monitoring

Periodic monitoring of fish populations, water temperature and whirling disease will continue.

Planned Future Monitoring

Additional monitoring will depend upon outcomes of the current restoration planning efforts.

HOYT CREEK: Priority - High

Description

Hoyt Creek, a small 1st order spring creek tributary to lower Dick Creek, originates from alluvial aquifers located immediately north of Ovando. This spring creek flows ~4 miles exclusively through private ranch land. Despite a low native species rank, Hoyt Creek ranks high in the restoration and total rank priority list. This rank is due to high (multi-species) sport fishery value and potential to improve flow and water quality in the watershed. Hoyt Creek supports WSCT, rainbow trout, brown trout and brook trout in generally low densities. Fisheries impairments, located throughout the stream, include channel instability, lack of habitat complexity, irrigation dewatering and suppressed riparian vegetation.

TMDL Issues

Not listed but is a tributary to the 303(d) listed Monture Creek.

Dewatering Issues

Approximately one mile of Hoyt Creek is on the dewatered stream list due to irrigation.

Native Species Issues

Bull trout core area stream
No known WSCT reproduction in the stream

Restoration Activities

Past Restoration

Grazing management changes, diversion upgrades and culvert to bridge replacements.

Current/Planned Restoration

The reconstruction of an incised portion of Hoyt Creek is being considered.

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 1992 and measured stream temperatures at two locations in 2001. Geomorphic assessments were completed in 2003 and 2004.

Ongoing Monitoring

None

Additional Planned Monitoring

Additional monitoring will be necessary depending on outcome of current restoration planning.

SPRING CREEK (North Fork): Priority - High

Description

Spring Creek, a small 1st tributary to the North Fork Blackfoot River, originates on the north side of Ovando Mountain. It flows ~6 miles through private land. Spring Creek ranks high on the restoration priority and total rank list due to a high native species rank, high (multi species) sport fishery value, and a potential to increase flows in the Blackfoot. Located in the bull trout core area, Spring Creek supports juvenile bull trout rearing, and low densities of fluvial WSCT and brook trout. Fisheries impairments include dewatering and fish losses to an irrigation ditch.

TMDL Issues

Not listed

Dewatering Issues

The lower 6.5 miles of spring creek in on dewatered stream list due to irrigation.

Native Species Issues

Bull trout core area stream

WSCT genetic composition: tested 97% WSCT

Restoration Activities

Past Restoration

The restoration of spring Creek began in 1998 with the installation of a diversion retrofitted with a fish ladder at mile 1.8. A baffled culvert replaced an undersized culvert at mile 0.5 in 1998 in order to improve upstream juvenile bull trout passage.

Current/Planned Restoration

Water conservation projects and irrigation ditch fish screening options are currently in the development phases.

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1997, 2000 and 2002. Stream flows were monitored by FWP in 2000 and BBCTU in 2003.

Ongoing Monitoring

None

Planned Future Monitoring

Fish population surveys and flow monitoring are expected to continue on a periodic basis one the instream flow and fish screening projects are complete.

BLACKFOOT RIVER (Reach 1: Headwaters to Lincoln): Priority - High

Description

The Blackfoot River begins on south-western slopes of the Continental Divide at river mile 132.5. This headwater reach begins as a small 2nd order stream at the confluence of Beartrap and Anaconda Creeks and extends 23.6 miles to the Lincoln (mile 108.9). It flows through private (Sieben Ranch Co, Plum Creek, privately owned) and public (National Forest, State) lands. Four larger basin-fed tributaries (upper Willow Creek, Alice Creek, Hogum Creek and the Landers Fork) feed this section of the river. These tributaries all support WSCT, usually brook trout and low densities of brown trout in lower reaches. Many other smaller tributaries not described in this report also support fisheries. The Landers Fork is the largest tributary and increases the Blackfoot River to a 4th order stream. Copper Creek, the largest tributary to the Landers Fork is the primary fluvial bull trout-spawning stream for the upper Blackfoot Watershed. This reach supports limited mainstem spawning by bull trout, WSCT and brown trout. This reproduction contributes to its high native species value and overall high total ranking on the restoration priority list. The effects of mining contamination remain the most serious threat to fish populations in this reach. Other mainstem fisheries impairments include: 1) instream flow limitations resulting primarily from natural stream losses with some irrigation in the lower portion of the reach, 2) channel alterations, 3) lack of instream wood, and 4) fish losses to an irrigation ditch. Whirling disease is also increasing in this reach.

TMDL Issues

Listed segment includes the Headwaters to Landers Fork and Landers Fork to Nevada Creek
Listing history: 1996, 2002, & 2004
Listed causes of impairment: Metals, siltation, and habitat alterations.

Dewatering Issues

The lower portion of this reach is dewatered due to natural stream losses and irrigation to a limited degree.

Native Species Issues

Bull trout nodal habitat, proposed critical bull trout habitat
WSCT migration corridor
WSCT genetic composition: tested 99-100% WSCT

Restoration Activities

Past Restoration

Some mine reclamation work has been completed

Current/Planned Restoration

Cleanup of toxic sites is planned on the national forest

Monitoring Activities

Past Monitoring

FWP established several fish population survey sections in this reach in the 1970s, which were periodically surveyed through 1999. Water quality and macro-invertebrates were assessed at three locations in 1988-89 (Ingman et al. 1990). A riparian health inventory was conducted in 1999 (Marler and Schmetterling). In 2000, FWP conducted a habitat survey of

the lower 12 miles of this reach with an emphasis on pool size, pool frequency, a large wood inventory, bankfull measurements, pebble counts, flow and water temperature measurements. FWP tested for whirling disease from 1998 through 2004. The USFS periodically collects McNeil core samples in this reach and completed fisheries surveys in 1999.

Ongoing Monitoring

FWP conducts periodic (4-10 year interval) fish population surveys and monitors summer water temperature data and whirling disease samples on an annual basis.

Planned Future Monitoring

None beyond periodic monitoring.

BLACKFOOT RIVER (Reach 2: Lincoln to Arrastra Creek): Priority - High

Description

This 20.1-mile reach of the upper Blackfoot River extends from Lincoln (mile 108.9) to Arrastra Creek (mile 88.8). It begins in an intermittent reach where the mainstem gains large volumes of groundwater and spring creek inflows during base-flow periods. Landownership consists of private and mixed public (National Forest, BLM and State) lands. Several basin-fed tributary streams enter this section of the Blackfoot (Poorman Creek Keep Cool Creek, Lincoln Gulch, lower Willow Creek, Sauerkraut Creek, Little Moose Creek, and Moose Creek), all supporting WSCT populations, as well as other salmonids depending on the specific stream. This gaining section of the river provides concentrated spawning areas for brown trout and very limited bull trout reproduction. Brown trout is the dominant species, followed by low, but increasing numbers of WSCT and very low bull trout densities, all of which contribute to its high ranking for native species value and multi-species sport fishery value. Overall, this reach ranks high in total ranking on restoration priority list. Fisheries impairments include: 1) localized lack of in complexity, 2) localized areas of historic and current livestock grazing involving on riparian vegetation and stream bank degradation, and 3) an increasing level of whirling disease.

TMDL Issues

Listed segment of the Blackfoot River includes Landers Fork to Nevada Creek
Listing history: 1996, 2002, and 2004
Listed causes of impairment: Siltation and habitat alterations

Dewatering Issues

Natural dewatering occurs in the upper-most portion of this reach. There are no human related-dewatering issues on this mainstem reach *per se*.

Native Species Issues

Bull trout nodal habitat, proposed critical bull trout habitat

Restoration Activities

Past Restoration

Riparian grazing management changes and localized streambank stability projects have been implemented.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP established the *Canyon* fish population survey section in the early 1970's and has periodically sampled this section. FWP completed several juvenile fish population surveys in 1998. A riparian health inventory was conducted in 1999 (Marler and Schmetterling. A baseline habitat survey and native fish telemetry study was completed in 2003-04. FWP tested for whirling disease between 1998 and 2002 and in 2004. Water quality and macroinvertebrates were assessed at two locations in 1988-89 (Ingman et al. 1990). The USFS conducts periodic McNeil core samples near the Nevada Ogden bridge.

Ongoing Monitoring

FWP conducts periodic fish population surveys in the Canyon section, along with annual monitoring of summer water temperatures and whirling disease samples.

Planned Future Monitoring

At this time, FWP no additional surveys beyond periodic monitoring activities.

BLACKFOOT RIVER (Reach 4: Nevada Creek to the North Fork.): Priority - High

Description

This reach extends 13.7 miles from the mouth of Nevada Creek (mile 67.7) downstream to the mouth of the North Fork Blackfoot River (mile 54). It flows mostly through private ranch with only ~0.8 mile flanked by public (State) lands on the south side at the lower portion of the reach. Below Nevada Creek, the river becomes more confined by moraine where channel gradient increases and sinuosity decreases. This reach is naturally subject to anchor-ice formation and high accumulations of fine sediment in the substrate. In addition to Nevada Creek, three small tributary streams (Yourname, Wales and Frazier Creeks) enter this reach, all of which are fisheries impaired. The sum of mainstem and tributary impairments result in very low mainstem salmonid densities. This reach ranks high in total ranking due to its high potential for improving water quality and increasing downstream flows and high in native species value, despite low rank for sport fishery value resulting from a lack of mainstem recruitment. Human-induced mainstem fisheries impairments include: 1) water quality problems originating from Nevada Creek involving elevated nutrients, 2) low summer flows, 3) high summer water temperatures, and 4) livestock suppressed riparian vegetation and stream bank degradation. Whirling disease is also increasing in this reach.

TMDL Issues

Listed section includes Nevada Creek to Monture Creek
Listing history: 1996, 2002, 2004
Listed causes of impairment: Nutrients, siltation, and thermal modifications

Dewatering Issues

The entire 13.7-mile reach is listed on the dewatered stream list due to mainstem irrigation and dewatering of all tributaries entering this reach.

Native Species Issues

Bull trout nodal habitat, proposed critical bull trout habitat

Restoration Activities

Past Restoration

Riparian grazing management improvements have occurred in this reach.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP established *Raymond Bridge* fish population survey section and a water temperature monitoring sites in this reach in 1988. In 2002, FWP moved the fish population surveys immediately upstream and renamed the survey site the *Wales Creek* section. FWP monitors populations in this reach on a bi-annual basis. Water quality and macro-invertebrates were assessed at four locations in 1988-89 (Ingman et al. 1990). A riparian heath assessment was completed in 1999 (Marler and Schmetterling 1999). FWP completed a habitat survey was completed for this reach in 2003. FWP measured whirling disease infection levels from 1998 through 2004.

Ongoing Monitoring

FWP expects to monitor fish populations in the Wales Creek section bi-annually, summer water temperatures annually and whirling disease on a periodic basis.

Planned Future Monitoring

None beyond ongoing monitoring activities.

MCCABE CREEK: Priority - High

Description

McCabe Creek, a small, 2nd order tributary to Dick Creek, flows ~9.5 miles through public (National Forest) and private (agricultural) land in middle to lower reaches. McCabe Creek ranked high on the restoration priority and total rank list due to a high native species rank, high biological rank, single species (WSCT) sport fishery value and low potential to improve water quality due to its restored condition. McCabe Creek, located in the bull trout core area, contains fluvial WSCT and brook trout. McCabe Creek has been the focus of a concerted restoration project that included a culvert upgrade, instream flow enhancement, elimination of irrigation ditch fish losses, instream habitat enhancement and riparian grazing changes. Except for suppressed riparian woody vegetation, the majority of fisheries impairments have been addressed through an extensive restoration program. The stream is currently in a recovery phase although grazing impairments continue.

TMDL Issues

Not listed: Tributary to the 303(d) listed Monture Creek

Dewatering Issues

Lower McCabe was a dewatered stream in lower reaches due to irrigation; however, water conservation measures have improved flows resulting in the removal of McCabe Creek from the dewatered stream list.

Native Species Issues
Bull trout core area stream
WSCT genetic composition: tested 98% WSCT

Restoration Activities

Past Restoration

A comprehensive restoration project for McCabe Creek began in 1999 and was completed in 2001. This project 1) consolidated four irrigation ditches into one pipeline and screened the intake; 2) converted flood to sprinkler irrigation; 3) restored habitat conditions including the placement of instream wood and shrub plantings along 1/2 mile of stream; 4) incorporated necessary riparian livestock management changes; and 5) improved a county road crossing. In 2001, the project completed the irrigation conversion, developed off-stream livestock watering and reconstructed ~1/2 mile of stream channel.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1992, 1995, 1997, and 1999-2004 and measured stream temperatures in 1998 and 2001.

Ongoing Monitoring

Fish population monitoring is approaching final monitoring phases.

Planned Future Monitoring

None, although a grazing monitoring plan should be initiated.

ALICE CREEK: Priority - High

Description

Alice Creek, an upper Blackfoot River 2nd order tributary, flows ~16 miles through mixed public (National Forest) and private ranch land. The lower ~3 miles of stream is exclusively private. Alice Creek ranks high on the restoration priority list and high in native species value as it supports very limited bull trout spawning and rearing, and populations of fluvial WSCT and brook trout. Alice Creek also ranked high on the biological priority list, but provides a low (single species) sport fishery value to the Blackfoot River and ranks low in potential water quality benefits. Recent fish population sampling found no fish in lower Alice Creek and low densities of WSCT in middle reaches. The upper reaches support low densities of WSCT and brook trout. Fisheries impairments near mile two include: 1) the lack of complex fish habitat (instream wood), 2) localized stream banks degradation and 3) an instream road crossing from recreational users. Sections of Alice Creek are seasonally intermittent.

TMDL Issues

Not listed

Dewatering Issues
The middle reaches of Alice Creek are seasonally intermittent, the extent of which is unknown.

Native Species Issues
Historic bull trout spawning stream
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration
The USFS has undertaken culvert removal in the headwaters, road closure and obliteration, two constructed ford installations and graveling of the Alice Creek road. Riparian shrub plantings were conducted in along the middle reaches in 2002.

Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP inventoried fish populations in 1999 and measured stream temperatures in 1999, 2001 and 2003 and stream flow in 2000. An ambient water quality survey was completed in 1989 (Ingman et al. 1990). The USFS conducted bull trout redd surveys in lower Alice Creek from 1999 to 2003.

Ongoing Monitoring
None

Planned Future Monitoring
None

CHAMBERLAIN CREEK: Priority - High

Description
Chamberlain Creek, a 2nd order tributary to the middle Blackfoot River, flows ~10 miles through both public (BLM) and private (Plum Creek and agricultural) lands. Private land is located in the lower seven miles of stream. Chamberlain Creek ranked high for restoration and total priorities and moderate for biological ranking. This moderate biological ranking is the result of improved flow and water conditions related to past restoration projects. Because Chamberlain Creek supports bull trout rearing and fluvial WSCT, it ranked high in native species value. Chamberlain Creek also supports a multi-species sport fishery value to the Blackfoot River. WSCT dominate the lower four miles along with low numbers of rainbow, brown, brook and bull trout. Fisheries impairments, located in the mid-to lower reaches include: 1) elevated stream sediment (road drainage), 2) livestock induced riparian vegetation suppression, 3) lack of complex fish habitat (instream wood), and 4) dewatering. Whirling disease was first detected in Chamberlain Creek in 1999 and infection had increased to a mean grade of 2.63 in 2002.

TMDL Issues
Listing history: 1996; in 2000, beneficial uses found to be fully supporting.

Dewatering Issues

The lower mile of Chamberlain Creek is on the dewatered stream list due to a diversion. A water lease is currently in place for 50% of the basin discharge, which maintains a minimal level of base flows.

Native Species Issues

Bull trout rearing
Fluvial WSCT spawning stream
WSCT genetic composition: tested 97-98 % WSCT

Restoration Activities

Past Restoration

Since 1990, Chamberlain Creek has been the focus of a comprehensive fisheries restoration effort. Projects include: road drainage repairs, riparian livestock management changes, fish habitat restoration, irrigation upgrades (consolidate ditches, water conservation, eliminate fish entrainment, fish ladder installation on a diversion), and improved stream flows through water leasing. Restoration occurred throughout the drainage but focused mostly in the lower mile of stream.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 1989, and resurveyed sampling sites in 1995, 1997, 1998, 2000 and 2002-2004. FWP completed a habitat survey in 1990. BLM flow monitoring occurs upstream of the West Fork. FWP measured water temperatures from 1999 through 2004 and stream flow in 1989 and 2000. FWP monitors two staff gauges associated with a water lease in the lower mile of stream. FWP began testing for whirling disease in 1997 and continued from 1999 through 2004. Telemetry identified this stream as an important WSCT spawning stream.

Ongoing monitoring

Fish population, whirling disease and flow monitoring related to the water lease are ongoing.

Planned Future Monitoring

FWP plans to evaluate instream sediment levels using McNeil core samples beginning in 2005.

MCELWAIN CREEK: Priority - High

Description

McElwain Creek, a 2nd order tributary to lower Nevada Creek, flows 9 miles through public (BLM) and private ranch land. Private land is located in the lower 6 miles of the stream. McElwain Creek ranks high on the restoration priority and total rank list due to its potential to increase flows in the Blackfoot river and high potential to improve water quality due to its degraded condition. McElwain received a low native species value as it lacks bull trout single species, but does support pure resident WSCT with densities decreasing in the downstream direction. Fisheries impairments, located mostly on private land, include 1)

poor road crossings and drainage, 2) irrigation impacts (fish passage and dewatering), 3) degraded riparian vegetation, and 4) excessive livestock access to stream banks.

TMDL Issues

Listing history: 1996; in 2000, lacks sufficient credible data to determine impairment.
Listed causes of impairment: Siltation, Flow alteration, pathogens.

Dewatering Issues

The lower mile of McElwain Creek is on the dewatered stream list due to irrigation.

Native Species Issues

WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

Some grazing improvements have been completed, including the removal of a streamside feedlot and offstream water development.

Current/Planned Restoration

Grazing improvements and offstream water are in the development phases.

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 1998 and measured stream temperatures in 2000-2002.

Ongoing Monitoring

None

Planned Future Monitoring

None

SALMON CREEK: Priority - High

Description

Salmon Creek, a small, 1st order outlet stream from Coppers Lake, flows ~2.5 miles in length through entirely public (National Forest) private agricultural land before joining Dry Creek to form Rock Creek. This small stream received high rankings for restoration priority and total rank, native species, biological and sport fishery values. Salmon Creek has a low potential to improve on water quality and received a low rank for social/financial considerations. Salmon Creek, located in the North Fork bull trout core area, supports very low densities of both juvenile bull trout and fluvial WSCT along with high densities of brook trout. Most of the habitat-related problems were corrected on Salmon Creek through extensive restoration. Current fisheries impairments, located on lower Salmon Creek include instream flow problems related to flood irrigation.

TMDL Issues

Not listed; tributary to Rock Creek a 303(d) listed stream

Dewatering Issues

Irrigation occurs but at currently insufficient levels to include Salmon Creek on the dewatered stream list.

Native Species Issues

Bull trout core area stream

No evidence of WSCT reproduction

Restoration Activities

Past Restoration

Between 1996 and 2000, a comprehensive fisheries improvement project was completed on Salmon Creek. The project included channel reconstruction, habitat enhancement, increased stream flows, changes to streamside grazing, removal of a streamside corral, fish screening on two ditches and the placement of a Denil fish ladder to the outlet structure of Spawn Lake.

Current/Planned Restoration

Water conservation projects are being discussed.

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1994, 1995, and 1999 and tested for whirling disease in 1997.

Ongoing Monitoring

None

Planned Future Monitoring

None

SHANLEY CREEK: Priority - High

Description

Shanley Creek, a 2nd order tributary to Cottonwood Creek, flows ~9 miles through public and private land, including the Bandy Experimental Ranch. Shanley Creek received a high total rank and biological rank and a moderate native species value. Shanley Creek's high total rank is due to a high (multi-species) sport fishery value and potential water quality benefits. Shanley Creek, located in the Cottonwood Creek bull trout core area, historically contained bull trout based on landowner interviews. However, this species was absent from recent FWP surveys. Shanley Creek now contains resident WSCT, brown trout and brook trout. WSCT dominate upper Shanley Creek. Brown trout dominate lower Shanley Creek. Several restoration projects were completed on Shanley Creek including livestock management changes, and screening an irrigation ditch. Current fisheries impairments include degraded riparian vegetation due to excessive livestock access to stream banks.

TMDL Issues

Not listed

Dewatering Issues

The lower 1.6 miles of Shanley Creek is on the dewatered stream list due to irrigation, although attempts are made to maintain a minimal flow level.

Native Species Issues
Bull trout core area stream.
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

Three restoration projects were completed on Shanley Creek beginning in 1994. These involved a riparian exclosures near the mouth, the placement of a fish screen on the ditch to Bandy Reservoir and the development of a three pasture riparian grazing system between stream mile 0.6 and 1.8.

Current/Planned Restoration

None, although grazing plans need to be evaluated and refined.

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 1993 and 1996 and continued to monitor populations in 1997, 2001 and 2003. FWP measured stream temperatures in 1997 and 1999 and tested for whirling disease in 1997.

Ongoing Monitoring

Periodic fish population monitoring related to restoration action is expected to continue.

Additional Planned Monitoring

None beyond periodic fish population monitoring. A grazing monitoring plan should be developed.

SPRING CREEK (upper Cottonwood): Priority - High

Description

Spring Creek, a 1st order tributary to upper Cottonwood Creek, flows ~2.5 miles exclusively through private timber and agricultural lands. Spring Creek scored high in total rank due to high native species value, high (multi-species) sport fishery value, and potential to increase flows to the Blackfoot River. Spring Creek has low potential to improve downstream water quality and ranks low in social and financial considerations. Located in the bull trout core area, Spring Creek supports WSCT and brook trout and bull trout rearing as recently as 1989. Since 1989, Spring Creek has been diverted on a year-around basis and is now disjunct from Cottonwood Creek. Bull trout have not been detected in more recent sampling. Fisheries impairments in the lower reaches include: 1) irrigation impacts (fish passage, entrainment, and dewatering), 2) channel alterations, and 3) suppressed riparian vegetation.

TMDL Issues

Not listed

Dewatering Issues

The lower mile of Spring Creek is on the dewatered stream list due to irrigation.

Native Species Issues
Bull trout core area stream.
WSCT genetic composition: untested

Restoration Activities

Past Restoration
None

Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP conducted fish population surveys in 1989 and 1999.

Ongoing Monitoring
None

Planned Future Monitoring
None

STONEWALL CREEK: Priority - High

Description

Stonewall Creek is a 1st order tributary stream to Keep Cool Cr, a 3rd order tributary stream to the upper Blackfoot River. Stonewall Creek drains the western slopes of Stonewall Mountain then flows south ~7.65 miles through a checkerboard of public (National Forest and State) and private lands. Stonewall Creek ranks high on the restoration priority and total ranking list due to a high sport fishery value (multi-species), and moderate potential to improve Blackfoot River water quality by reducing sediment and temperature and increase stream flows. Stonewall Creek supports populations of WSCT, brown trout, and brook trout. Fish densities are low throughout the drainage. Brown and resident brook trout are found in the lower reaches of the stream. Middle reaches support resident WSCT and brook trout and only WSCT were found in the upper reaches. Fisheries impairments include: 1) elevated sediment levels, 2) excessive livestock grazing impacts on riparian vegetation, 3) over-widened stream banks and braided channel, 4) instream flows (dewatering both natural and irrigation induced), 5) extensive placer mining, and 6) a stream ford at the USFS boundary.

TMDL Issues
Not listed

Dewatering Issues
The lower two miles of Stonewall Creek is on the dewatered stream list due to irrigation and natural losses.

Native Species Issues
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys and measured water temperatures in 2004.

Ongoing Monitoring

None

Planned Future Monitoring

None

WALES SPRING CREEK: Priority - High

Description

Wales Spring Creek, a 1st order spring creek tributary to lower Wales Creek, flows ~0.9 miles through private ranch land. Wales Spring Creek ranks high on the restoration priority and total ranking list due to its high potential to improve water quality, moderate native species value and multi-species sport fishery value to the Blackfoot River. Wales Spring Creek supports moderate densities of brown trout and very low densities of WSCT. Fish likely coming from Wales Creek, no spawning habitat observed. Fisheries impairments include: 1) slumping stream banks, 2) excessive livestock grazing impacts on riparian vegetation (grasses).

TMDL Issues

Not listed

Dewatering Issues

None

Native Species Issues

No evidence of WSCT reproduction

Restoration Activities

Past Restoration

None

Current/Planned Restoration

Wales Spring Creek will be assessed for restoration in 2005.

Monitoring Activities

Past Monitoring

FWP inventoried fish populations and measured stream flows in 2003.

Ongoing Monitoring

None

Planned Future Monitoring

None

WASSON CREEK: Priority - High

Description

Wasson Creek is a small 1st order tributary to upper Nevada Spring Creek with a length of ~8.4 miles. The Wasson drainage contains both public (National Forest) land in the upper drainage and private land downstream of mile ~ 4. Wasson Creek ranks high on the restoration priority and total ranking list due to a high rank in potential water quality benefits, potential to increase flow in the Blackfoot River, moderate native species values and a moderate rank in social and financial considerations. Wasson Creek supports high densities of WSCT in upper reaches with densities decreasing significantly in lower reaches. Impairments to fisheries, located in the middle and lower reaches, include: 1) excessive livestock access to the stream, 2) channel alterations, 3) dewatering, 4) possible fish barriers at diversion points, and 5) a culvert crossing on the National Forest.

TMDL Issues

Not listed but is tributary to the 303 (d) listed Nevada Spring Creek.

Dewatering Issues

The lower two miles of Wasson Creek is listed on the dewatered stream list due to irrigation.

Native Species Issues

WSCT genetic composition: tested 100% pure

Restoration Activities

Past Restoration

Past restoration actions involve irrigation diversion upgrades, cattle fords, off stream water developments and riparian pastures.

Current/Planned Restoration

A comprehensive restoration project for Wasson Creek is currently being developed with private landowners. The project is expected to include: 1) enhancement of instream flows, 2) improvement of riparian grazing and 3) reconstruction of less than a mile of stream.

Monitoring Activities

Past Monitoring

FWP inventoried fish population 1991 and re-surveyed established sites in 2000, 2003 and 2004. FWP measured stream temperatures and stream flows in 2000, 2003 and 2004 and tested for whirling disease in 1997. Channel measurements related to instream flow needs and channel reconstruction were collected 2004.

Ongoing Monitoring

FWP expects to continue to monitor fish populations, flows and water temperatures on an ongoing basis until approximately 2010, if the current restoration project develops as anticipated.

Planned Future Monitoring

None beyond expected ongoing monitoring.

MODERATE PRIORITY STREAMS

BEAR CREEK (rm 12.2): Priority – Moderate

Description

Bear Creek, a small, 2nd order tributary to the lower Blackfoot River, flows ~6 miles through private land including industrial forest in upper reaches. Bear Creek has received extensive restoration over the last several years. With the exception of undersized culverts in the headwaters, Bear Creek is approaching final restoration phases. Bear Creek ranks moderate on the restoration priority list for total and biological rank and high for native species and multi-species sport fishery value but low in potential water quality benefit due to the completion of many restoration projects in the basin. Bear Creek supports limited bull trout rearing, fluvial WSCT, rainbow trout, brown trout and resident brook trout. Bear Creek is the tributary south of reach 6 of the Blackfoot River thought to provide significant recruitment to the Blackfoot River sport fishery. Fisheries-related impairments involve perceived elevated levels of stream sediment resulting from extensive timber harvest and road drainage. Culverts at two locations appear undersized and should be evaluated for fish passage. In the lower reaches of Bear Creek, the stream is currently in the restoration recovery phases where channel reconstruction and grazing management changes were completed.

TMDL Issues

Not listed

Dewatering Issues

None

Native Species Issues

Bull trout rearing

WSCT genetic composition: untested

Restoration Activities

Past Restoration

Beginning in 1995, approximately 6000' of lower Bear Creek was reconstructed or habitat enhanced where channelization and historical grazing had damaged the channel. The project involved grazing management changes, shrub planting and improved diversions at two locations. In 1996, culverts at two locations were upgraded; however, these culverts do not appear to be meeting fish passage objectives and need to be re-evaluated.

Current/Planned Restoration

Two possible stream crossings are under consideration for upgrades.

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1994, 1995, and 1998-2004. Water temperature data was collected in 1998, 2001 and 2002. FWP completed a post reconstruction habitat

survey in 1998. FWP tested for whirling disease in bear Creek in 2004, the results of which are pending.

Ongoing Monitoring
Fish population monitoring in the restoration project area is nearing completion.

Planned Future Monitoring
McNeil core sampling is tentatively planned for 2005-06. Periodic project monitoring and fish population survey may continue. Stream sediment delivery should also be evaluated.

BLACKFOOT RIVER (reach 3: Arrastra creek to Nevada Creek): Priority – Moderate

Description
This 4th order reach extends 21.1miles from Arrastra Creek (mile 88.8) downstream to Nevada Creek (mile 67.7) through a mix of private ranch and public (National Forest, State and BLM) lands. No tributary streams enter this reach of the Blackfoot River. The channel loses slope and becomes highly sinuous, erosive and prone to the deposition of fine sediment due to the extremely low channel slope. Instream wood and channel complexity decreases in the downstream direction. Water temperature changes are more extreme during summer and winter as compared with the upstream reach (2) . The salmonid assemblage includes low densities of brown trout as the dominant fish, followed by very low densities of WSCT and bull trout. This reach ranks high in native species and biological values but moderate with other criteria, resulting in a moderate total rank. Beyond a host of natural limiting factors, human-related fisheries impairments include: 1) irrigation related low flows, 2) entrainment of fish to some ditches, 2) reduced instream complexity, and 3) excessive livestock to riparian areas resulting in suppressed riparian vegetation and stream bank degradation. Whirling disease is also increasing in this reach.

TMDL Issues
Listed segment include Landers Fork to Nevada Creek
Listing history: 1996, 2002, and 2004
Listed causes of impairment: Siltation and habitat alterations

Dewatering Issues
The majority of this river reach (17.1 miles) is on dewatered stream list due to irrigation.

Native Species Issues
Bull trout nodal habitat, proposed critical bull trout habitat

Restoration Activities

Past Restoration
Streamside corrals were removed at one location.

Current/Planned Restoration
One fish screen project is being developed. Irrigation canal on this portion of the Blackfoot River will be evaluated for entrainment in 2005.

Monitoring Activities

Past Monitoring

An FWP completed habitat survey and native fish telemetry study was completed in 2003-04. Water temperature monitoring began in the early 1990s. A USGS monitoring station (#12335100) was recently established and has three years of continuous flow data. Water quality and macro-invertebrates were assessed at one location in 1988-89 (Ingman et al. 1990). A riparian health inventory was conducted in 1999 (Marler and Schmetterling).

Ongoing Monitoring

FWP collects monitors summer water temperature and whirling disease surveys on an annual basis.

Planned Future Monitoring

None beyond ongoing monitoring activities.

DRY CREEK: Priority – Moderate

Description

Dry Creek is a tributary to Rock Creek in the North Fork of the Blackfoot River drainage. It flows through public (National Forest) land except for the lower-most portion of the stream. Dry Creek ranks moderate on the restoration priority and total rank list and has a high native species value. Dry Creek is considered a non-impaired stream due to recent grazing management changes on private land, which will address the only known fisheries-impairment to this stream. Dry Creek supports bull trout rearing, fluvial WSCT and resident brook trout.

TMDL Issues

Not listed; Tributary to the 303(d) listed Rock Creek

Dewatering Issues

The lower 0.5 miles of lower Dry Creek is on the dewatered stream list due to natural losses.

Native Species Issues

Bull trout core area stream
Fluvial WSCT spawning stream
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

Riparian grazing improvements were initiated in 2001.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1994 and 2000. The USFS has collected McNeil core sampling over several years.

Ongoing Monitoring

None

Planned Future Monitoring
None

LITTLE FISH CREEK: Priority – Moderate

Description
Little Fish Creek is a small 1st order tributary stream to the lower Blackfoot River. Draining the southern slopes of Lost Horse Mountain, it flows 5.8 miles in a northwest direction through a mix of public (State, BLM) and private agricultural and industrial forest (Plum Creek) lands before entering the Blackfoot River at river mile 32.8. Little Fish Creek received a moderate total ranking because of a high ranking in social and financial considerations, a high biological ranking and moderate native species value. Little Fish also has a single-species sport fishery value and potential to increase flows to the Blackfoot. Little Fish Creek supports only WSCT throughout it entire length. Fish densities are low and decrease in the downstream direction. Fisheries impairments include: 1) road crossing (undersized culvert), 2) irrigation impacts (low flow), 3) areas of excessive livestock grazing on riparian vegetation, stream bank degradation, and moderate to high sediment levels, and 4) road drainage.

TMDL Issues
Not listed

Dewatering Issues
Unknown

Native Species Issues
WSCT genetic composition: tested 100% WSCT

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish populations in 2003.
Ongoing Monitoring
None
Planned Future Monitoring
None

LODGEPOLE CREEK: Priority - Moderate

Description
Lodgepole Creek is the primary tributary to Dunham Creek. It drains Monture Mountain before flowing exclusively through public (National Forest) land. Lodgepole Creek received a moderate rank on the restoration priority and total rank list due to its high native species

value, moderate biological priority rank, and lack of any known impairments. Lodgepole Creek supports both WSCT and bull trout in low numbers.

TMDL Issues
Not listed

Dewatering Issues
None

Native Species Issues
Bull trout core area stream, proposed critical bull trout habitat.
WSCT genetic composition: untested

Restoration Activities

Past Restoration
A bridge was constructed on the Forest Service land to facilitate high flows and address fisheries concerns.

Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP conducted fish population surveys in 1996.

Ongoing Monitoring
None

Planned Future Monitoring
None

NEVADA SPRING CREEK: Priority - Moderate

Description
Nevada Spring Creek, a 2nd-order spring creek tributary to lower Nevada Creek, flows ~3.2 miles in length exclusively though private ranch land. Nevada Spring Creek ranks moderate on the restoration priority and total rank list due to moderate native species values and high biological priority values. Nevada Spring Creek has potential to increase flow in the Blackfoot and the high potential to improve downstream water quality to lower Nevada Creek and possibly the Blackfoot River. Nevada Spring Creek supports very low densities of fluvial WSCT and brown trout in the upper reaches and very low densities of WSCT, brown trout and bull trout in the lower reaches. Before 2001 fisheries impairments, located over the length of the stream include: 1) irrigation impacts (dewatering and fish passage), 2) channel alterations, 3) lacks instream complexity, 4) degraded riparian vegetation resulting from excessive livestock access to stream banks. Nevada Spring Creek tested negative for whirling disease in 2002.

TMDL Issues
Listing history: 1996, 2000, 2002, & 2004
Listed causes of impairment: Habitat alterations and siltation

Dewatering Issues

Dewatering issues were addressed as part of the 2003 restoration project.

Native Species Issues

Limited bull trout rearing

WSCT genetic composition: untested

Restoration Activities

Past Restoration

Since 2001, Nevada Spring Creek has been the focus of a concerted restoration effort over its entire length, which included channel reconstruction, instream flow enhancement and riparian grazing changes. The entire Nevada Spring Creek has been subject to an extensive restoration project, involving complete reconstruction and livestock management measures.

Current/Planned Restoration

Current planned work involves completion of localized floodplain work. This involves importing sod mats to areas where the floodplain is to be elevated to better maintain channel cross-section. Shrub planned for the final phases of the project.

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 1990 and resurveyed monitoring sites in 1991-02, 1994, and in 2000-2004. FWP sampled dissolved oxygen and water quality at two sites in 1989. FWP measured stream temperatures in 2000 through 2004, and stream flows in 2000, 2002 and 2004. FWP completed a baseline habitat assessment in 1990 and post-project survey in 2003-04. FWP tested for whirling disease in 1997 and 2002-2004.

Ongoing Monitoring

Fish population and water temperature measurements are expected to continue for the next 3-5 years.

Planned Future Monitoring

None beyond ongoing monitoring

YOURNAME CREEK: Priority - Moderate

Description

Yourname Creek, a 2nd order tributary to the middle Blackfoot River, originates near Elevation Mountain and flows ~9 miles through both public (BLM) and private land. Public land is found only in the upper 1.4 miles of stream. Yourname Creek ranks moderate for restoration priority and total rank due to a 1) moderate native species value, 2) single-species sport fishery value to the Blackfoot River, 3) potential to improve downstream water quality to the Blackfoot River, and 3) potential to increase flow to the Blackfoot River. Yourname Creeks ranks low for social and financial considerations. Yourname Creek supports a genetically pure population of fluvial WSCT with densities increasing substantially in the upstream direction. Fisheries impairments include: 1) irrigation impacts (dewatering and entrainment), 2) lack of instream complexity, and 3) degraded stream banks resulting form excessive livestock access to riparian areas.

TMDL Issues
Listing history: 1996, 2000, 2002, & 2004
Listed causes of impairment: Flow alterations

Dewatering Issues
The lower mile of Yourname Creek is on the dewatered stream list due to irrigation.

Native Species Issues
WSCT genetic composition: tested 100% pure

Restoration Activities

Past Restoration
None

Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP inventoried fish populations in 1992 and 2000, measured stream temperatures in 2000-2004 and stream flows in 2000.

Ongoing Monitoring
None

Planned Future Monitoring
None

EAST TWIN CREEK: Priority - Moderate

Description
East Twin Creek is a small 2nd order tributary to the lower Blackfoot River. It flows ~5 miles through private land, except for a small parcel of public land in the headwaters. East Twin Creek ranks moderate on the restoration priority list, due to low potential for improving downstream water quality and increasing flows to the Blackfoot River, and a high ranking in native species value as it supports bull trout rearing and fluvial WSCT. East Twin Creek provides a high (multi-species) sport fishery value to the Blackfoot River by supporting a diverse fish assemblage of fluvial WSCT, bull trout, rainbow trout, brown trout, and resident brook trout. In general, densities are low for all species in the lower to middle reaches. The only known problem for East Twin Creek is an undersized culvert, which contributes to localized channel instability.

TMDL Issues
Not listed

Dewatering Issues
None

Native Species Issues

Restoration Activities

Past Restoration

An undersized culvert was replaced in the mid-1990s.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1996, 1998 and 2000, and measure stream temperature in 1998, 1999 and 2001.

Ongoing Monitoring

None

Planned Future Monitoring

None

JOHNSON CREEK: Priority - Moderate

Description

Johnson Creek is a 2nd order tributary to the lower Blackfoot River that drains public (National Forest) and private land. Johnson Creek received a moderate rank in the total and restoration priority rank list, and a high native species rank. Restoration work (fish passage near the mouth) was completed in 1997. And no additional impairments on this stream have been identified since. Johnson Creek is a small, cold stream that supports several fish species including bull trout, WSCT, rainbow trout and brown trout in low numbers.

TMDL Issues

Not listed

Dewatering Issues

None

Native Species Issues

Bull trout rearing stream, concentrates bull trout at the mouth
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

A stream crossing was improved in the late 1997 to improve fish passage.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish population 1997, measured stream temperatures in 1999 and stream flow in 2000.

Ongoing Monitoring
None
Planned Future Monitoring
None

KEEP COOL CREEK: Priority - Moderate

Description
Keep Cool Creek, a 3rd order tributary to the upper Blackfoot River, drains Stonewall Mountain and the Keep Cool Lakes. Keep Cool Creek flows ~12 miles through public (National Forest) land before entering private land near mile ~6. Keep Cool Creek ranks moderate in the total ranking and restoration priority list. This rank is due to a moderate native species rank, high (multi-species) sport fishery value to the Blackfoot River and high potential to improve water quality in the Blackfoot River by reducing sediment and temperature. Keep Cool Creek supports populations of fluvial WSCT and brown trout and limited bull trout use. Brown trout are found in low numbers in the lower reaches of the stream. Fisheries impairments include 1) mining impacts, 2) dewatering and 3) excessive access by livestock to the stream banks in the middle reaches.

TMDL Issues
Not listed

Dewatering Issues
Two miles of upper Keep Cool Creek are on the dewatered stream list due to irrigation.

Native Species Issues
Receives fluvial bull trout use (non spawning)
WSCT genetic composition: tested 100% WSCT

Restoration Activities
Past Restoration
The middle portion of Keep Cool Creek is currently under more sensitive grazing management. The USFS has upsized culverts.
Current/Planned Restoration
The USFS is planning additional road crossing improvements on the Sucker/Copper road.

Monitoring Activities
Past Monitoring
FWP inventoried fish population and measured stream temperatures and stream flows in Keep Cool Creek in 2004.
Ongoing Monitoring
None
Planned Future Monitoring
None

PEARSON CREEK: Priority - Moderate

Description

Pearson Creek, a small 2nd order Garnet Mountain tributary to Chamberlain Creek, flows ~9 miles through mostly private (Plum Creek) land and a small section of public (BLM) land in the upper reaches. Pearson Creek ranks moderate on the restoration priority and total rank list due to a moderate native species rank, low (single-species) sport fishery value and high potential for improving downstream water quality. Pearson Creek supports fluvial WSCT in the lower drainage. Pearson Creek has been the site of and extensive restoration program, which corrected the majority of identified problems. Current fisheries impairments located in lower Pearson Creek include: 1) lack of instream complexity, 2) degraded riparian vegetation, and 3) road drainage problems.

TMDL Issues

Not listed

Dewatering Issues

Two miles of lower Pearson Creek are listed on the dewatered stream list due to natural losses and past irrigation practices. This reach of stream has been under a water lease since 1996 and currently is not dewatered except in drought years.

Native Species Issues

WSCT genetic composition: tested 98% WSCT

Restoration Activities

Past Restoration

Reconstruction of three segments of channel totaling ~4,000 feet of stream, water lease for all flows from the watershed, habitat restoration including shrub planting, wood placement and grazing management changes began in 1996.

Current/Planned Restoration

Additional grazing management changes are ongoing.

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1994, 1995, 1997, 1999, 2001, and 2002-2004.

Ongoing Monitoring

Annual water lease and fish population monitoring are expected to continue.

Planned Future Monitoring

Future grazing monitoring is needed.

SAUERKRAUT CREEK: Priority - Moderate

Description

Sauerkraut Creek, a 1st order tributary to the upper Blackfoot River, flows ~7 miles through public (National Forest) land in the headwaters and private land downstream of mile ~3. Sauerkraut Creek received a moderate rank on the restoration priority and total rank list due high native species values, high (multi-species) sport fishery value to the Blackfoot River, and moderate potential to improve water quality in the Blackfoot River. Sauerkraut Creek

received a low rank for social and financial considerations. Sauerkraut Creek supports limited bull trout rearing, fluvial genetically pure WSCT, brown trout and brook trout. We found bull trout and brown trout in lower Sauerkraut Creek, whereas WSCT and brook trout are found throughout the drainage. Brook trout densities decrease in the upstream direction. Fisheries impairments, located in the middle reaches, include: 1) undersized culverts, 2) road sediment delivery to the stream, 3) channelization and a lack of instream complexity due to placer and gravel mining activity, and 3) stream bank damage in localized area excessive livestock access to riparian areas.

TMDL Issues
Not listed

Dewatering Issues
Unknown

Native Species Issues
Limited bull trout rearing
Fluvial WSCT spawning stream
WSCT genetic composition: tested 100% WSCT

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish population in 1999 and measured stream temperatures in 2002 and 2003. Telemetry identified this stream as a fluvial WSCT spawning stream.
Ongoing Monitoring
None
Planned Future Monitoring
None

WALES CREEK: Priority - Moderate

Description

Wales Creek, a 2nd order tributary to the middle Blackfoot River, flows ~9 miles through both public (BLM) in headwater areas and private ranch land downstream of mile ~4. Wales Creek ranks moderate in total rank and restoration priority due to a 1) moderate native species value, 2) high (multi-species) sport fishery value to the Blackfoot River, 3) potential to increase flow in the Blackfoot, and 4) potential to improve water quality in the Blackfoot River. Wales Creek ranks low for social and financial considerations. A large instream reservoir limits the ability to address the entire Wales Creek system. Species composition is comprised of fluvial WSCT (below reservoir) and resident WSCT (above reservoir). The lower reaches also contain low brown trout densities. Above the reservoir, (mile 2.0), Wales

Creek supports genetically pure WSCT. Fisheries impairments above and below the reservoir include stream bank damage resulting from excessive livestock access to riparian areas. Severe dewatering occurs below the reservoir.

TMDL Issues

Listing history: 1996; in 2000, 2002, & 2004 lacks sufficient credible data to determine impairments.

Listed causes of impairment: Flow alterations and siltation.

Dewatering Issues

The lower 1.9 miles of Wales Creek is on the dewatered stream list due to irrigation.

Native Species Issues

WSCT genetic composition: tested 100% above the reservoir

Isolet WSCT population above the reservoir

Introgression present below the reservoir

Restoration Activities

Past Restoration

Riparian pasture was developed upstream of the reservoir in 2004 in order to reduce grazing pressure on the riparian area.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1989, 2000 and 2003, measured stream temperatures in 2001, 2003 and 2004 and stream flows in 1989, 2000 and 2003. A telemetry study in 2002-03 identified Wales Creek as an important WSCT spawning stream. FWP tested for whirling disease in 2004.

Ongoing Monitoring

None

Planned Future Monitoring

None

WEST TWIN CREEK: Priority - Moderate

Description

East Twin Creek is a small 3rd order tributary to the lower Blackfoot River, which originates from the slopes of Wisher Ridge and Sheep Mountain. It flows south through public (National Forest) and private land. West Twin Creek is a past project stream in which the only known impairment was addressed with the completion of a fish passage project at Highway 200. West Twin Creek received a moderate rank on the restoration priority and total rank list and a high native species value. West Twin Creek supports a high value sport fishery with a mixed species composition of WSCT, rainbow trout, brown trout, and brook trout in low numbers.

TMDL Issues
Not listed

Dewatering Issues
None

Native Species Issues
WSCT genetic composition: untested

Restoration Activities
Past Restoration
FWP assisted with a fish passage project near the mouth in the early 1990s
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP conducted fish population surveys in 1996, measured stream flows in 2000, measured stream temperatures in 1998, 1999 and 2001 and tested for whirling disease in 2004.
Ongoing Monitoring
None
Planned Future Monitoring
None

ARRASTRA CREEK: Priority - Moderate

Description

Arrastra Creek, a large 2nd order middle Blackfoot River tributary, flows 13 miles through public (National Forest) and private land. The lower half of the stream is private. Arrastra Creek ranks moderate in total ranking on the restoration priority list. Supporting bull trout spawning and rearing and genetically pure fluvial WSCT, it ranks high in native species value. Arrastra Creek provides a high (multi-species) sport fishery value to the Blackfoot River and ranks high on the biological priority list. A telemetry study conducted in the Blackfoot River watershed in 2002-03 identified Arrastra Creek as a primary fluvial WSCT spawning tributary. Arrastra Creek also supports populations of brown trout and resident brook trout. Fish densities are low for all species in lower reaches, but increase to moderate levels in middle reaches. Upper Arrastra Creek supports a native fish assemblage with both WSCT and bull trout. Fisheries impairments include a complete fish passage barrier in upper Arrastra Creek and a partial barrier in lower Arrastra Creek. We have identified no substantive water quality problems for Arrastra Creek; sediment-related issues are likely due to extensive timber harvest and road construction in the watershed. Fisheries impairments include 1) riparian timber harvest and habitat simplification and suspected road drainage, 2) perched culverts limiting upstream fish passage in the headwater and near the mouth, and 3) localized recreational impacts to stream banks. A low level of whirling disease was detected in Arrastra Creek in 2003.

TMDL Issues

Listing History: 2000, 2002, & 2004

Listed causes of impairment: Siltation and other habitat alterations.

Dewatering Issues

Arrastra Creek is on dewatered stream list between mile 2.0 and 4.5 due to natural dewatering.

Native Species Issues

Non-core area bull trout spawning stream.

Fluvial WSCT spawning stream

WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

None

Current/Planned Restoration

The removal of perched culverts at stream mile 3.5 is planned for fall of 2005. Velocities at high flows through these culverts have been measured at 8 ft/sec, sufficient to prevent seasonal upstream movements.

Monitoring Activities

Past Monitoring Activities

FWP inventoried fish population data in 1989 and resurveyed sites in 1996, 1999 and 2004, measured stream temperatures in 1999, 2001, 2002, 2003 and stream flows in 1989 and 2000. FWP began testing for whirling disease in 2003 and 2004. An ambient water quality survey was completed in 1989 (Ingman et al. 1990).

Ongoing Monitoring

Periodic samplings of fish populations and whirling disease are expected to continue.

Planned Future Monitoring

McNeil core samples are planned for 2005. An evaluation of roads and road drainage from a stream – sediment delivery perspective should also be conducted in the watershed.

BLACKFOOT RIVER (REACH 5: N.F to the CLEARWATER): Priority - Moderate

Description

This 5th order reach of the Blackfoot River extends 19.3 miles from the North Fork (mile 54) downstream to the Clearwater River (mile 34.7). It flows through a mix of private agricultural and industrial forest (Plum Creek) lands and public (BLM, State) lands. Several tributaries enter this reach (North Fork Blackfoot River, Warren Creek, Monture Creek, Chamberlain Creek, Cottonwood Creek, and Bear Creek). With the exception of Bear Creek, these streams and many of their tributaries have been the focus of restoration actions. The two largest tributaries entering this reach, Monture Creek and the North Fork, are critical bull trout spawning streams. To varying degrees, these streams also support and recruit WSCT, rainbow and brown trout to the Blackfoot River. This reach ranked moderate in total ranking as a result of high native species value, a lack of sport fishery value due to the absence of mainstem spawning, and a low potential in downstream water quality benefits. In this reach,

rainbow trout become the dominant mainstem salmonid followed by brown trout, WSCT and bull trout. Densities of all species are below potential due to drought, whirling disease and tributary impairments. Most of the mainstem impairments are localized and include channel alterations, past livestock grazing, recreation impacts to banks. Whirling disease has escalated to high levels in this reach.

TMDL Issues
Listed segments include Nevada Creek to Monture Creek and Monture Creek to the Clearwater River.
Listing history: 1996, 2002, and 2004
Listed causes of impairment: Nutrients, siltation, and thermal modifications

Dewatering Issues
Although this river reach is subject to upstream dewatering, it is not on the dewatered stream list due to generally sufficient flows except during drought conditions.

Native Species Issues
Bull trout nodal habitat; proposed critical bull trout habitat, bull trout recovery/recreational conflict area

Restoration Activities
Past Restoration
Riparian grazing management changes have occurred in many areas of this reach.
Current/Planned Restoration
None planned

Monitoring Activities
Past Monitoring
FWP established the Scotty Brown Bridge fish population survey section in 1982. Fish population and water temperature surveys began in the 1980s. FWP tested for whirling disease testing from 1997 through 2004. DEQ assessed water quality and macro- at four locations in 1988-89 (Ingman et al. 1990).

Ongoing Monitoring
DNRC monitors flows using aquarods during drought years upstream of the Clearwater River junction. FWP monitors summer water temperature and whirling disease on an annual basis.
Planned Future Monitoring
None beyond ongoing monitoring.

CLEARWATER RIVER: Priority - Moderate
Description
Clearwater River is a major 4th order tributary stream to the middle Blackfoot River. The effluence of Clearwater Lake, it flows ~ 45.8 miles through seven lakes (Clearwater chain-o-lakes) and a checkerboard of private, industrial forest (Plum Creek) and public (National Forest and State) lands to its confluence with the Blackfoot River at mile 34.7. The Clearwater River ranks moderately in total ranking on the restoration priority list. This

ranking is due in part to low rankings for its potential to improve downstream water quality and social and financial considerations. It also ranked moderate for native species priority, but ranked high in multi-species sport fishery value to the Blackfoot River. Because of the lack of data, only the lower 3.5miles of the Clearwater River is currently the focus of restoration efforts at this time. The Clearwater River supports a multi-species fishery. Data collected in a 2003 fish trap study show salmonid species present include WSCT, rainbow trout, brown trout, and mountain white fish. Bull trout have also been observed in the system. In addition, various species of forge fish (longnose dace and red-side shiners) are present. The Clearwater chain-of-lakes and river are also a major source of northern pike to the Blackfoot River. Fisheries impairments include irrigation impacts.

TMDL Issues
Not Listed

Dewatering Issues
The lower 3.5 miles of the Clearwater River is on the dewatered stream list due to irrigation.

Native Species Issues
Fluvial WSCT migration corridor

Restoration Activities

Past Restoration

None

Current/Planned Restoration

An instream flow project was completed in 2004 for the lower 3.5 miles of stream. This project is intended to increase instream flows during drought years. A fish screen is also planned for the canal in 2005.

Monitoring Activities

Past Monitoring

FWP conducted juvenile fish population surveys in 1989. FWP conducted electrofishing and ditch trapping in the Clearwater ditch in 2001, 2003 and 2004 to determine number and species entrained. FWP measured water temperatures in 1998 and 2000-2004 and stream flows in 1989, 2000 and 2004. FWP tested for whirling disease in 1997 and 2004. An ambient water quality survey was completed in 1989 (Ingman et al. 1990).

Ongoing Monitoring

Periodic fish population and water temperature monitoring

Planned Future Monitoring

In addition to ongoing periodic monitoring, flows will be monitored in the Clearwater canal during low flows years as part of an emergency drought plan.

DOUGLAS CREEK: Priority - Moderate

Description

Douglas Creek, a major 3rd order tributary to lower Nevada Creek, flows ~22 miles through public (BLM) and private ranch land. Most of the drainage, the lower ~18 miles, is private agricultural land. Douglas Creek ranked high for potential water quality benefits and

increases stream flows to the Blackfoot River, but low in native species value and lacks a sport fishery value which contributed to Douglas Creek's moderate restoration and total priority rank. The upper reaches support pure resident WSCT in moderate densities. Lower and middle Douglas Creek supports low numbers of native non-game fish species. Fisheries impairments, located throughout the drainage, include 1) lack of complex fish habitat (instream wood), 2) livestock induced stream bank degradation and riparian vegetation suppression, 3) elevated sediment and elevated nutrient levels and elevated water temperatures, 4) channel degradation related to instability and to road construction, and 5) reduced instream flows from irrigation.

TMDL Issues
Listing history: 1996, 2000, 2002, & 2004
Listed causes of impairments: Siltation, habitat and flow alterations, thermal modification, nutrients, salinity, TDS and chloride.

Dewatering Issues
The lower 14 miles of Douglas Creek is dewatered due to irrigation.

Native Species Issues
Isolet WSCT population in headwaters of mainstem
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration
Fish ladders were constructed around two instream reservoirs in the headwaters in order to include population size for disjunct WSCT in the headwaters.
Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP conducted fish population surveys in 1994, 1997 and 2000, and measured water temperatures in 1998 and 2000 and stream flows in 2000.
Ongoing Monitoring
None
Planned Future Monitoring
None

FISH CREEK: Priority - Moderate

Description
Fish Creek, a 1st order tributary to the lower Blackfoot River, flows ~5 miles through mostly private timber land with a small portion of public (State) land in middle reaches. Fish Creek ranks moderate on the restoration priority list due to a moderate native species value, single species sport fishery value to the Blackfoot River, and potential to increase stream flows to the Blackfoot River. We identified no potential water quality improvement benefits on Fish Creek. Fish Creek supports fluvial WSCT with densities that increase in the upstream

direction. Fisheries impairment in the lower ~3 miles include: 1) dewatering, 2) channel alteration (instream pond), and 3) an undersized culvert creating possible fish barriers.

TMDL Issues
Not listed

Dewatering Issues
The lower 0.3 miles of Fish Creek is on the dewatered due to irrigation.

Native Species Issues
WSCT genetic composition: tested 98% WSCT

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish populations in 2001.
Ongoing Monitoring
None
Planned Future Monitoring
None

LINCOLN SPRING CREEK: Priority - Moderate

Description
Lincoln Spring Creek, a large 1st order spring creek flowing through the town of Lincoln, flows ~5 miles exclusively through private (residential) ownership. Lincoln Spring Creek ranked moderate on the restoration priority and total rank list. This rank is due to a moderate native species value, high (multi-species) sport fishery value to the Blackfoot River, potential to increase flow in the Blackfoot River, and low rank for social and financial considerations. The feasibility to address the entire stream is also questionable. Lincoln Spring Creek currently supports brown trout and brook trout in low densities and receives limited use by fluvial WSCT, but no reproduction. Fisheries impairments include: 1) poor road crossings, 2) lack of instream complexity, 3) degraded riparian vegetation, and 4) residential development.

TMDL Issues
Not listed

Dewatering Issues
Unknown

Native Species Issues
Historical bull trout use likely
No evidence of WSCT reproduction

Restoration Activities

Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP inventoried fish populations in 1995 and measured stream temperatures in 2004. FWP tested for whirling disease in 1997 and 2004.
Ongoing Monitoring
None
Additional Planned Monitoring
None

JACOBSEN SPRING CREEK: Priority - Moderate

Description
Jacobsen Spring Creek is a small 1st order spring creek tributary to the North Fork Blackfoot River, a major tributary and bull trout core stream in the Blackfoot River watershed. Jacobsen Spring Creek originates on and flows ~1.6 miles exclusively through private ranch land. It ranks moderately in total ranking and restoration priority, primarily because of its multi-species sport fishery value, high potential to improve downstream water quality, and high social and financial considerations. Jacobsen Spring Creek supports low densities of brown and moderate numbers of resident brook trout throughout it length. Very low densities of rainbow trout are also present in its lower and middle reaches. Rainbow spawning activity has also been observed in its middle reaches. Fisheries impairments include: 1) areas of livestock-induced stream channel degradation, 2) lacks complex fish habitat (instream wood), 3) livestock-induced riparian vegetation degradation and suppression.

TMDL Issues
Not listed

Dewatering Issues
This stream is being evaluated for dewatering.

Native Species Issues
Bull trout core area stream
No evidence of WSCT reproduction

Restoration Activities

Past Restoration
None

Current/Planned Restoration

The lower mile of Jacobsen Spring Creek is being considered for reconstruction and grazing management changes.

Monitoring Activities

Past Monitoring

FWP and USFWS conducted fish population surveys, monitored flows and collected temperature data in 2004. Geomorphic data (pebble counts, cross-section data) was also collected. The stream was tested for whirling disease in 2004.

Ongoing Monitoring

Stream flow measurements are ongoing.

Planned Future Monitoring

Additional monitoring will be considered as restoration plans are developed.

NEVADA CREEK (upper): Priority - Moderate

Description

Upper Nevada Creek, a large 3rd order stream, drains the northern slopes of Nevada Mountain on the continental divide. It flows ~ 18.8 miles through a combination of public (National Forest) and private agricultural lands before emptying into Nevada Creek Reservoir at mile 33.7. Upper Nevada Creek received a moderate total rank on the restoration priority list. This rank is due to a high native species value, high potential to improve downstream water quality and moderate social and financial considerations. It lacks sport fishery value to the Blackfoot River. Upper Nevada Creek supports populations of WSCT, rainbow trout, and brook trout. The USFS reports bull trout in upper reaches of Nevada Creek in very low numbers. Low densities of resident WSCT also inhabit the upper reaches of Nevada Creek on National Forest, but numbers decrease in the downstream direction. Rainbow trout and brook trout in low densities are found on private agriculture land upstream of Nevada Reservoir. Many additional tributaries not included in this report that have been sampled by the USFS. These streams variously contain WSCT and brook trout, some of which also have impairments identified by the USFS. Fisheries impairments on the mainstem of upper Nevada Creek include: 1) irrigation impacts (low flow), 2) channel alterations and instability, 3) lacks complexity (lacks instream wood), 4) excessive livestock grazing impacts on riparian vegetation and stream bank degradation, 5) low instream flows due to irrigation, 6) historic mining, and) undersized culverts and road sediment delivery to the stream.

TMDL Issues

Listing history: 1996, 2000, 2002, & 2004

Listed causes of impairments: Flow and habitat alteration, nutrients, siltation, thermal modification, suspended solids, metals, and nitrogen.

Dewatering Issues

Six miles of Nevada Creek upstream of the reservoir (stream mile 34-40) is on the dewatered stream list due to irrigation-induced low flows.

Native Species Issues

WSCT genetic composition: tested 91% WSCT

Restoration Activities

Past Restoration

The North Powell Conservation District and NRCS has been involved in attempting to correct non-point runoff problems on private agricultural areas.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish population in 1957, 1996 and 2001 and measured stream temperatures in 2000 and 2001. A USGS gauging station monitors stream flows upstream of Nevada Reservoir.

Ongoing Monitoring

USGS flow monitoring

Planned Future Monitoring

None beyond ongoing flow monitoring.

SUCKER CREEK: Priority - Moderate

Description

Sucker Creek, a 1st order tributary to Keep Cool Creek, drains the southeastern slopes of Stonewall Mountain. It flows south then southwest ~ 6.0 miles through a checkerboard of public (National Forest and State) lands and private ranch lands. Sucker Creek received a moderate rank on the restoration priority and total rank list. This moderate rank is the result of its high potential to improve water quality for the Blackfoot River, but lack of sport fishery value. Sucker Creek supports very low densities of WSCT and brook trout in its lower reaches. Fisheries impairments include: 1) irrigation dewatering, 3) elevated sediment levels, 3) excessive livestock grazing impacts to stream banks and riparian vegetation, 4) lack of instream complexity, and 5) and undersized culvert.

TMDL Issues

Not listed

Dewatering Issues

The lower mile of Sucker Creek is on the dewatered stream list due to irrigation and has a seasonally intermittent reach on the National Forest.

Native Species Issues

WSCT genetic composition: untested

Restoration Activities

Past Restoration

None

Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP surveyed fish populations and measured stream temperatures in 2004.

Ongoing Monitoring
None

Planned Future Monitoring
None

UNION CREEK: Priority - Moderate

Description
Union Creek, a primary 3rd order tributary to the lower Blackfoot River, flows ~18 miles through both public (BLM) and mainly private ranch land. The lower ~15 miles of this stream flows through private land. Union Creek ranks moderate on the restoration priority and total rank list. The moderate ranking results from a low native species rank, absence of sport fishery to the Blackfoot River, low rank for social and financial considerations, but high potential to improve water quality and increase flows to the Blackfoot River. Union Creek contains both brook trout and WSCT. Brook trout are present in very low densities in the middle reaches. Resident WSCT were sampled in low numbers in the middle and upper reaches. Fisheries impairments, located in the middle and lower reaches include: 1) poor road crossings (undersized culvert), 2) irrigation impacts (low instream flows), 3) lack of instream complexity, and 4) degraded riparian vegetation resulting from excessive livestock access to stream banks. Lower portions of Union Creek are also undergoing channel incision.

TMDL Issues
Listing history: 1996, 2000, 2002, 2004
Listed causes of impairment: Flow alterations, habitat alterations, siltation, thermal modification, metals, nutrients, and suspended solids.

Dewatering Issues
The lower 7.0 miles is on the dewatered stream list due to irrigation.

Native Species Issues
WSCT genetic composition: tested 92% WSCT

Restoration Activities

Past Restoration
None

Current/Planned Restoration
None

Monitoring Activities

Past Monitoring

FWP inventoried fish population in1989 and re-surveyed sites in 2000, measured water temperature in 2001 and 2002, measured stream flows in 1989 and 2000 and tested for whirling disease in 2004. An ambient water quality survey was completed in 1989 (Ingman et al. 1990).

Ongoing Monitoring

None

Planned Future Monitoring

None

WILLOW CREEK (UPPER): Priority - Moderate

Description

Willow Creek above Lincoln, a 2nd order tributary to the upper Blackfoot River, flows ~8 miles through public (National Forest) in headwaters and private land downstream of mile ~6. Willow Creek ranked moderate for total rank and restoration priority due to high potential to improve water quality for the Blackfoot River and single-species sport fishery value to the Blackfoot River. Willow Creek ranks low in native species value and supports low densities of resident WSCT and brook trout. Headwater tributaries on the National Forest also contain WSCT. Fisheries impairments, located in the lower reach include localized stream bank degradation resulting from excessive livestock access to riparian areas.

TMDL Issues

Listing history: 1996, 2000, & 2004

Listed causes of impairment: Bank erosion, habitat alterations, and siltation

Dewatering Issues

The middle reach is seasonally intermittent although the extent is unknown.

Native Species Issues

Fluvial WSCT spawning stream

WSCT genetic composition: tested 100% pure

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish population in 1999 and measured stream temperatures in 2003. A telemetry study conducted by FWP identified upper Willow Creek as an important WSCT spawning tributary. FWP tested for whirling disease in 2004. An ambient water quality survey was completed in 1989 (Ingman et al. 1990).

Ongoing Monitoring
None
Planned Future Monitoring
None

WILSON CREEK: Priority - Moderate

Description
Wilson Creek, a 1st order tributary to Lincoln slough (Nevada Creek), flows ~6 miles first through public (National Forest) and private ranch downstream of mile ~3. Wilson Creek ranks moderate on the restoration priority and total rank list due to a high potential to improve downstream water quality and potential to increase flows to the Blackfoot, low native species value, lack of sport fishery value to the Blackfoot River and low rank for social and financial considerations. Wilson Creek supports a disjunct population of resident WSCT at very low densities. Fisheries impairments in the middle to lower reaches include: 1) placer mining in the headwaters, 2) poor road crossings, 3) irrigation impacts (fish entrainment, low flows), and 4) lack of connectivity to Nevada Creek.

TMDL Issues
Not listed

Dewatering Issues
The lower 0.8 miles of stream is on the dewatered stream list due to irrigation.

Native Species Issues
Isolet WSCT population
WSCT genetic composition: tested 100% pure

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish population, measured stream temperatures and stream flows in 2000.
Ongoing Monitoring
None
Planned Future Monitoring
None

CHAMBERLAIN CREEK, East Fork: Priority - Moderate

Description
The East Fork of Chamberlain Creek, a small, 1st order tributary to Chamberlain Creek, flows ~3.5 miles entirely through private (Plum Creek) lands. The East Fork is a past project stream. Past projects include correcting road drainage and replacing a culvert near the

mouth. The East Fork ranks moderate on the restoration priority list, biological priority list and native species priority list. These moderate rankings results from single species sport fishery status, and low potential for both water quality improvements and downstream flow benefits to the Blackfoot River. The lower reaches of the East Fork support high densities of fluvial WSCT. Fisheries impairments, located in the lower reaches, are believed to still include elevated instream sediment levels from poor road drainage. The new culvert may also restrict upstream movement of juvenile fish. The East Fork of Chamberlain tested negative for whirling disease despite positive results for whirling disease in the mainstem of Chamberlain Creek.

TMDL Issues
Not listed

Dewatering Issues
None

Native Species Issues
Fluvial WSCT spawning stream
WSCT genetic composition: untested

Restoration Activities

Past Restoration
A culvert was upgraded. Some erosion control work on Plum Creek properties was completed in the mid-1990s.

Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP inventoried fish populations in 1997 and measured stream temperatures in 1999 and 2000. FWP tested for whirling disease in 1999 and 2000.

Ongoing Monitoring
None

Planned Future Monitoring
None

HOGUM CREEK: Priority - Moderate

Description
Hogum Creek, a 2nd order tributary to the upper Blackfoot river, flows ~6 miles through both public (National Forest) in headwaters and private land downstream of mile ~ 2. Hogum Creek ranks moderate in total rank and restoration priority. This moderate rank is due to a moderate native species value and (high) multi-species sport fishery value to the Blackfoot River. Hogum Creek ranks low in potential water quality benefits and moderate in social rank. Hogum Creek supports very limited numbers of bull trout, WSCT, brown trout and brook trout. All species, except the bull trout, show upstream increases at low densities. Headwater tributaries on the National Forest contain both WSCT and brook trout. Fisheries

impairments in the lower reaches include road crossings (undersized culvert) and localized stream bank degradation from livestock.

TMDL Issues
Not listed

Dewatering Issues
None

Native Species Issues
Bull trout rearing,
Fluvial WSCT spawning stream
WSCT genetic composition: tested 99-100% WSCT

Restoration Activities

Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP inventoried fish populations in 1995 and 1999, measured water temperatures in 2003 and stream flow in 2000. Telemetry identified this stream as a fluvial WSCT spawning stream.
Ongoing Monitoring
None
Planned Future Monitoring
None

MOOSE CREEK: Priority - Moderate

Description
Moose Creek, a small 1st order tributary to the upper Blackfoot River, flows ~4 miles through National Forest land, except for a small section of private land near the mouth. Moose Creek ranks moderate in total rank and restoration priority due to a moderate native species value, single species sport fishery value to the Blackfoot River and a high rank for social and financial considerations. Due to adequate flows and healthy riparian area, Moose Creek ranks low in potential to improve water quality and provides no potential for increasing flows to the Blackfoot River. Moose Creek supports a population of fluvial WSCT. Fishery impairments near the mouth include placer mining and two undersized culverts that partially limit upstream fish passage.

TMDL Issues
Not listed

Dewatering Issues

None

Native Species Issues

WSCT genetic composition: tested 99-100% WSCT

Restoration Activities

Past Restoration

None

Current/Planned Restoration

The USFS and others are planning to replace an undersized culvert near the mouth and remove a second culvert.

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 1999 and measured stream temperatures in 2002 and 2003 and stream flows in 2000 and 2004.

Ongoing Monitoring

None

Planned Future Monitoring

None

BASIN SPRING CREEK: PRIORITY - MODERATE

Description

Basin Spring Creek is a 1st order spring creek tributary to lower Pearson Creek, a lower Chamberlain Creek tributary. This stream flows ~0.15 miles exclusively through private agricultural land. Basin Spring Creek ranked moderate on the restoration priority list, moderate on the native species priority list and low on the biological priority list. Restoration efforts on Basin Creek in the early 1990's included channel reconstruction, shrub planting and grazing management changes. We have no identified current impairments on this stream. Basin Spring Creek serves as a migration corridor for fluvial WSCT to Pearson Creek and supports low densities of resident brook trout.

TMDL Issues

Not listed

Dewatering Issues

None

Native Species Issues

Fluvial WSCT migration corridor

Restoration Activities

Past Restoration

The upper section of this stream was reconstructed in 1995. The project involved wetland enhancement and riparian grazing changes.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1991, 1995 and 1997.

Ongoing Monitoring

None

Planned Future Monitoring

None

BLACK BEAR CREEK: Priority - Moderate

Description

Black Bear Creek, a small 1st order tributary to Bear Creek in the upper Douglas Creek watershed, flows ~7.5 through both public (BLM) and private agricultural land. The upper reaches are public land. Black Bear Creek ranks moderate on the restoration priority list despite a high rank in potential water quality benefits, and currently does not support fish, resulting in a low biological and native species rank. Riparian impairments in the lower reaches include: 1) livestock induced stream bank degradation and riparian vegetation suppression, 2) a crushed and undersize culvert, and 3) reduced instream flow from irrigation.

TMDL Issues

Listing history: 1996, 2000, 2002, & 2004

Listed causes of impairment: Habitat alterations and siltation

Dewatering Issues

unknown

Native Species Issues

No native fish present

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP conducted electrofishing surveys and measured flows in 2000.

Ongoing Monitoring
None
Planned Future Monitoring
None

BLACKFOOT RIVER (Reach 6: Clearwater River to the mouth): Priority - Moderate

Description
The lower reach of the Blackfoot River extends 34.7 from the mouth of the Clearwater River (mile 34.7) downriver to the confluence with the Clark Fork River. It flows through private, agricultural and industrial forest (Plum Creek) and public (BLM, State) lands. Several tributaries enter this reach of the Blackfoot River. In the downstream direction, they are Fish Creek, Little Fish Creek, Elk Creek, Belmont Creek, Gold Creek, Union Creek, Bear Creek, East and West Twins and Johnson Creek. This reach ranks moderate in total ranking due to a high native species value, high social and financial considerations, low sport fishery value due to a lack of mainstem spawning and low potential of improving downstream water quality. This reach supports the highest salmonid densities in the Blackfoot River. The salmonid assemblage includes rainbow trout as the dominant fish, followed by brown trout, WSCT and bull trout. The majority of bull trout in this reach reproduce in the Monture and North Fork watersheds. Milltown dam located at the mouth of the Blackfoot River represents the largest fisheries impairment in the system. Lesser habitat related mainstem fisheries impairments are localized and include: 1) channel alterations, 2) lacks complexity, 3) road drainage, 4) livestock suppressed riparian vegetation and stream bank damage and 5) recreational impacts in the form of stream bank damage. This reach now supports moderate to high levels of whirling disease.

TMDL Issues
Listed segments include Clearwater River to Belmont Creek and Belmont Creek to mouth.
Listing history: 1996, 2000, and 2004
Listed causes of impairment: Siltation, habitat alterations, metals, total toxics, unionized ammonia

Dewatering Issues
Although this river reach is subject to upstream dewatering, it is not on the dewatered stream list due to generally sufficient flows except during drought.

Native Species Issues
Nodal bull trout habitat; proposed critical bull trout habitat, nodal bull trout habitat Junctions of cold tributaries considered bull trout recovery/ recreational conflict areas.

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities

Past Monitoring

A USGS flow monitoring station (#1234000) established at river mile 7.9 has 68 years of flow data. FWP established the *Johnsrud* fish population survey section in 1982, continuous summer water temperature sites monitoring in 1993, and sentinel cage whirling disease monitoring sites in 1997. Water quality and macro-invertebrates were assessed at four locations in 1998-89 (Ingman et al. 1990). A riparian health inventory was conducted in 1999 from Corrick River bend to the mouth of Gold Creek, with noxious weeds, erosion and channel incision as the focus (Marler and Schmetterling 1999).

Ongoing Monitoring

FWP conducts bi-annual fish population surveys in the Johnsrud Section. USGS flow monitoring at the Bonner gauging station is continuous. FWP expects to continue to monitor summer water temperature data and whirling disease on an annual basis in this river reach.

Planned Future Monitoring

None beyond expected ongoing monitoring.

GRANTIER SPRING CREEK: Priority - Moderate

Description

Grantier Spring Creek is a spring-fed tributary to the upper Blackfoot River, located on private land. Grantier Spring Creek was the focus of extensive restoration over the past several years including channel reconstruction, habitat restoration and riparian land management changes. Grantier Spring Creek supports low densities of bull trout and fluvial WSCT as well as brown trout and brook trout, giving rise to a multi-species sport fishery value to the Blackfoot River and a high native species value. Because of restoration efforts, it now has low potential water quality benefits to the Blackfoot River. No fisheries impairments are present at this time.

TMDL Issues

Not listed

Dewatering Issues

None

Native Species Issues

Adult bull trout use, likely historical bull trout spawning
Fluvial WSCT migration corridor

Restoration Activities

Past Restoration

Grantier Spring Creek was reconstructed in the early-mid 1990s. The project involved grazing management improvements.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP conducted fish population surveys in 1991 and 1994, measured water temperatures in 2001 and stream flows in 1989. FWP monitored whirling disease in 1997 and 2004.

Ongoing Monitoring

None

Planned Future Monitoring

None

SEVEN UP PETE CREEK: Priority - Moderate

Description

Seven Up Pete Creek, a 1st order tributary to the upper Blackfoot River drains the slopes of Crater Mountain and flows ~5 miles through both National Forest and private land. Private land is located only between mile 3 and 4. Seven Up Pete Creek ranks moderate in restoration priority and total rank. This rank is due to moderate native species values and single species sport fishery value to the Blackfoot River. Seven Up Pete Creek ranks low for potential to improve water quality in the Blackfoot River. Seven Up Pete Creek supports low densities of genetically pure fluvial WSCT and brook trout. Fisheries impairments include mining practices in headwater areas and an ATV trail that fords the stream a minimum of 15 times.

TMDL Issues

Not listed

Dewatering Issues

Unknown

Native Species Issues

WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish population in 1999.

Ongoing Monitoring

None

Planned Future Monitoring

None

LOW PRIORITY STREAMS

ASHBY CREEK: Priority - Low

Description

Ashby Creek, a 2^{nd} order tributary to Camas Creek in the Union Creek watershed, flows ~8 miles through public land in upper reaches and private agricultural land in the lower ~5.5 miles. Ashby Creek ranks low on the restoration priority list. Low native species value and lack of sport fishery value contributes this ranking, despite high potential for downstream water quality benefits. Ashby Creek supports a genetically pure population of resident WSCT along with brook trout and ranks moderate on the native species priority list. Densities are generally low for both species, although WSCT numbers increase in the upstream direction. Fisheries-related impairments, located in the middle and lower reaches, include 1) irrigation (seasonal fish passage and dewatering), 2) severe channel alterations, 3) lack of complex fish habitat, 4) excessive livestock access to riparian areas, and 5) elevated sediment from road drainage.

TMDL Issues

Not listed

Dewatering Issues

Channel alterations and inter-basin transfers to Arkansas Creek have caused dewatering for ~ 2.5 miles of Ashby Creek.

Native Species Issues

WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

None

Current/Planned Restoration

Five Valleys Land Trust is taking the lead to secure a conservation easement to restore a portion of Ashby Creek and surrounding wetlands.

Monitoring Activities

Past Monitoring

FWP inventoried fish population in 2000 and measured water temperatures in 2002.

Ongoing Monitoring

None

Planned Future Monitoring

Additional monitoring plans will be developed in conjunction with final restoration plans.

BEAR CREEK (R.M. 37.5): Priority - Low

Description

Bear Creek, a small, 2^{nd} order tributary to the middle Blackfoot River, flows ~4 miles through public (BLM) and private land in middle reaches. A lack of potential water quality benefits, moderate native species value and moderate biological ranking characterizes Bear

Creek's low total ranking on the restoration priority list. Bear Creek supports fluvial WSCT, providing low (single species) sport fishery value to the Blackfoot River. The lower reaches support low densities WSCT that increase to moderate levels in the middle and upper reaches. Fisheries impairments include undersize culverts limiting fish passage.

TMDL Issues
Not listed

Dewatering Issues
None

Native Species Issues
WSCT genetic composition: tested 96.5% WSCT

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish populations in 1998.
Ongoing Monitoring
None
Planned Future Monitoring
None

CAMAS CREEK: Priority – Low

Description
Camas Creek, a 3rd order tributary to Union Creek in the lower Blackfoot River water shed, flows ~10 miles through private agricultural land. Overall, Camas Creek ranks moderate on the restoration priority list. This low rank results, low native species value, and no sport fishery value to the Blackfoot River despite potential downstream water quality benefits. Camas Creek supports resident WSCT and brook trout. Fish sampling found no salmonids in the lower Camas Creek. The middle reaches support brook trout in low number, while moderate numbers of WSCT dominates the headwaters, including Smith Creek an upper tributary of Camas Creek. Fisheries impairment in the middle and lower reaches include 1) livestock-induced stream bank degradation, 2) riparian vegetation suppression, and 3) lack of complex fish habitat (instream wood).

TMDL Issues
Listing history: 1996; in 2000, 2002, & 2004 uses assess are fully supported. Other uses not assessed.
Listed causes of impairment: Flow alterations, siltation, and thermal modifications.

Dewatering Issues
Unknown

Native Species Issues
WSCT genetic composition: untested

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish populations in 2000 and measured stream temperatures in 2002.
Ongoing Monitoring
None
Planned Future Monitoring
None

CHAMBERLAIN CREEK, West Fork: Priority - Low

Description
The West Fork of Chamberlain Creek, a small, 1st order tributary to lower Chamberlain Creek, flows ~2.5 miles entirely through private (Plum Creek) lands. The West Fork ranks low on the restoration, biological, and native species priority list. The lower reaches of the West Fork likely supports fluvial WSCT. Fisheries impairments, located in the lower reaches, are elevated instream sediment levels from poor road drainage. No fish sampling data has been collected on the West Fork; however, the mainstem near the mouth of the West Fork supports high densities of fluvial WSCT along with low numbers of brook trout. The West Fork of Chamberlain Creek tested negative for whirling disease in 1999 and 2000.

TMDL Issues
Not listed

Dewatering Issues
None

Native Species Issues

Restoration Activities
Past Restoration
Some erosion control and riparian grazing changes were implemented in the mid 1990s.
Current/Planned Restoration
None

Monitoring Activities

Past Monitoring

FWP tested for whirling disease and measured stream temperatures in 1999 and 2000.

Ongoing Monitoring

None

Planned Future Monitoring

None

CHICKEN CREEK: Priority - Low

Description

Chicken Creek, a small 1st order tributary to Nevada Creek, flows ~4 miles through mainly private land with a small portion of public land (National Forest) near the headwaters. The total rank for Chicken Creek is low. This low rank comes from low native species value, no sport fishery value to the Blackfoot River despite high potential water quality benefits. Lower Chicken Creek supports low densities of resident rainbow trout, while the middle reaches support low numbers of resident WSCT. Fisheries impairments in the lower 1.5 miles include 1) livestock-induced stream channel degradation, 2) riparian vegetation suppression, 3) a lack complex fish habitat (instream wood), and 4) an undersized culvert on the National Forest.

TMDL Issues

Not listed

Dewatering Issues

Unknown

Native Species Issues

WSCT genetic composition: tested 100% WSCT

Isolet WSCT population

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations and measured stream flows in 2000.

Ongoing Monitoring

None

Planned Future Monitoring

None

CHIMNEY CREEK (Trib. to Douglas Creek): Priority - Low

Description

Chimney Creek, a 1st order tributary to middle Douglas Creek, flows ~7.4 miles entirely through private ranch land. Chimney Creek ranks low on the restoration priority list for non-project streams. Despite potential for downstream water quality and moderate social rank, Chimney Creek ranks low due to low native species value, and no sport fishery value to the Blackfoot River. Lower Chimney Creek supports only non-game fish species. The middle reaches support low densities of resident WSCT. Fisheries impairments include 1) livestock induced stream channel degradation and riparian vegetation suppression, 2) the lack of complex fish habitat (instream wood), and 3) channel alterations (instream reservoirs for irrigation).

TMDL Issues

Not listed; Tributary to the 303(d) listed Douglas Creek

Dewatering Issues

Unknown

Native Species Issues

WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations and measured stream flow in 2000.

Ongoing Monitoring

None

Planned Future Monitoring

None

LITTLE MOOSE CREEK: Priority - Low

Description

Little Moose Creek is a small 1st order tributary that drains the northern slopes of Ogden Mountain. The majority of its 1.9 miles flow through public (National Forest and State) lands. Only the lower 0.4 miles flow on private land where it empties into an isolated oxbow pond, only biologically connecting into the Blackfoot River during spring run-off. Little Moose Creek ranks low on the restoration priority and total rank list. Little Moose Creek supports very low densities of resident WSCT throughout it entire length. No known fishery impairments are present at this time.

TMDL Issues
Not Listed

Dewatering Issues
None

Native Species Issues
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP measured water temperature in 2002 and 2003. USFS inventoried fish populations.
Ongoing Monitoring
None
Planned Future Monitoring
None

MURRAY CREEK: Priority - Low

Description
Murray Creek, a 2nd order tributary to Douglas Creek, flows ~8 miles through public (BLM) and private agricultural land downstream of mile ~4. Murray Creek received a low rank on the restoration priority and total rank list. This rank relates to a low native species rank, lack of a sport fishery value to the Blackfoot River despite potential to improve downstream water quality. Murray Creek supports low densities of genetically pure resident WSCT in the middle and upper reaches with densities increasing in the upstream direction. Fisheries impairments, located in the lower and middle reaches, include: 1) poor road crossings (perched and undersized culverts) and road drainage, 2) irrigation (dewatering and fish entrainment), 3) lack of instream complexity, and 4) degraded stream banks resulting from excessive livestock access to riparian areas.

TMDL Issues
Listing history: 1996; in 2000, 2002, & 2004 lacks sufficient credible data for impairment determinations.
Listed causes of impairment: Flow and habitat alteration, thermal modifications, and siltation.

Dewatering Issues
The lower three miles of Murray Creek are on the dewatered stream list due to irrigation.

Native Species Issues
WSCT genetic composition: tested 100% WSCT

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish population and measured stream flows in 2000.
Ongoing Monitoring
None
Planned Future Monitoring
None

SHEEP CREEK: Priority - Low

Description
Sheep Creek, a small 1st order tributary to Sturgeon Creek, located in the Douglas Creek watershed, flows ~4 miles exclusively through private ranch land. Sheep Creek ranks low for total rank, due to low native species value, lack of a sport fishery value, despite high potential to improve downstream water quality and a high social rank. No salmonid or other fish species were detected in Sheep Creek when it was sampled in 2000. Riparian impairments include low instream flows due to an aggraded channel and excessive livestock access to stream banks over most of the channel.

TMDL Issues
Not listed

Dewatering Issues
Unknown

Native Species Issues
No native fish present

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP sampled Sheep Creek for fish in 2000.

Ongoing Monitoring
None
Planned Future Monitoring
None

WARM SPRINGS CREEK: Priority - Low

Description

Warm Springs Creek, a small 1st order tributary to lower Gold Creek, flows ~2.5 miles primarily through private land with a small portion of public land. Warm Springs Creek ranks low for restoration priority and total rank. This low rank is due to low native species value, low (single-species) sport fishery value to the Blackfoot River and low potential for improved water quality benefits. However, Warm Springs Creek has potential to increase flow in the Blackfoot. Despite bull trout core area status, Warm Springs Creek supports low densities of resident rainbow trout and no other species. Fisheries impairments include: 1) fish passage problems at a road crossing, 2) excess road drainage, and 3) irrigation impacts.

TMDL Issues
Not listed

Dewatering Issues
The lower mile of Warm Springs Creek in on the dewatered stream list due to irrigation.

Native Species Issues
Bull trout core area stream
WSCT not detected

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish populations in 1998.
Ongoing Monitoring
None
Planned Future Monitoring
None

FINN CREEK: Priority - Low

Description

Finn Creek, a small 2nd order tributary to upper Nevada Creek, flows ~3.3 miles entirely through private ranch land. Finn Creek ranks low in total ranking and currently has no native species or sport fishery value to the Blackfoot River, but did rank high in potential water quality benefits. No fish were collected on Finn Creek when it was sampled in 2001.

Fisheries impairments in the lower ~2 miles include: 1) low flows due to an aggraded channel, 2) livestock-induced stream bank degradation and riparian vegetation suppression, and 3) lack of complex fish habitat (instream wood).

TMDL Issues

Not listed; tributary to Nevada Creek a 303(d) listed stream

Dewatering Issues

Unknown

Native Species Issues

No native fish present

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish population in 2001.

Ongoing Monitoring

None

Planned Future Monitoring

None

HALFWAY CREEK: Priority -Low

Description

Halfway Creek, a 3rd order stream, flows northwest 8.5 miles through private ranchland and enters Nevada Creek at mile 40.3. Halfway Creek ranks low in the total ranking due to a low native species value, lack of sport fishery value to the Blackfoot River and moderate social and financial rank. Halfway Creek ranked high in potential to improve downstream water quality including temperature, sediment and nutrients. No salmonids were collected at two sampling sites in Halfway Creek in 2001. Fish species were limited to redside shiner, longnose sucker and sculpin. Spotted frogs and western toads were also observed. Fisheries impairments include: 1) degraded riparian vegetation; 2) excessive livestock access to stream banks; 3) lack of instream complexity; 4) high sediment levels; and 5) thermal modification.

TMDL Issues

Not listed; Tributary to the 303(d) listed Nevada Creek

Dewatering Issues

Unknown

Native Species Issues
No native salmonids found

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish populations and measured water temperatures and stream flow in 2001.
Ongoing Monitoring
None
Planned Future Monitoring
None

MITCHELL CREEK: Priority - Low

Description
Mitchell Creek, a 1st order tributary to Nevada Creek, flows ~7 miles through a combination of public (National Forest) land in the headwaters and private agricultural land downstream of mile ~4. Mitchell Creek ranks low in restoration priority and total rank due to low native species value, lack of sport fishery value to the Blackfoot River, and moderate potential to improve downstream water quality. The only salmonid present in Mitchell Creek is resident WSCT in low to moderate densities. Fisheries impairments in middle reaches include 1) an undersized culvert near the mouth, 2) a general lack complex fish habitat, and 3) livestock access to stream banks.

TMDL Issues
Not listed; Tributary to the 303(d) listed Nevada Creek

Dewatering Issues
Unknown

Native Fish Issues
WSCT genetic composition: untested

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations and measured stream temperatures and stream flows in 2001.

Ongoing Monitoring

None

Planned Future Monitoring

None

STURGEON CREEK: Priority - Low

Description

Sturgeon Creek, a small 3rd order tributary to Douglas Creek, flows ~4 miles exclusively through private ranch land. Sturgeon Creek ranks low on the restoration priority and total rank list. This low rank is due to lack of native species and absence of sport fishery value to the Blackfoot River. However, Sturgeon Creek ranks high for potential to improve downstream water quality. No salmonids were sampled in Sturgeon creek, but a small spring creek tributary supports a small disjunct population of resident WSCT. Fisheries impairments located throughout the drainage include: 1) channel alterations (instream reservoir), 2) degraded riparian vegetation, 3) inadequate instream flow, and 4) excessive livestock access to stream banks.

TMDL Issues

Not listed; Tributary to the 303(d) listed Douglas Creek

Dewatering Issues

Unknown extent

Native Species Issues

WSCT genetic composition: tested 100% WSCT in the spring creek

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish population and measured stream flows in 2000.

Ongoing Monitoring

None

Planned Future Monitoring

None

WASHOE CREEK: Priority - Low

Description

Washoe Creek, a small 1st order stream, flows ~6.2 miles through public land (BLM) in headwaters and private ranch land downstream of mile ~3.5. Washoe Creek ranks low on the restoration priority and total ranking list. This low rank is due to low native species value, lack of sport fishery value to the Blackfoot River and potential to improve downstream water quality. Washoe Creek ranks moderate for social and financial consideration. Washoe Creek supports resident WSCT. Fisheries impairments in the lower Washoe Creek include excessive livestock access to stream banks and lack of instream complexity.

TMDL Issues

Listing history: 1996; in 2000, 2002, and 2004 uses assessed are fully supporting. Other uses not assessed.

Listed causes of impairment: Flow and habitat alterations and siltation.

Dewatering Issues

Unknown

Native Species Issues

WSCT genetic composition: tested 99% WSCT

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 2000 and 2002 and measured water temperatures in 2002.

Ongoing Monitoring

None

Planned Future Monitoring

None

ARKANSAS CREEK: Priority - Low

Description

Arkansas Creek, a small 1st order tributary to Ashby Creek in the Union Creek watershed, flows 5 miles through private (Plum Creek and agricultural) land. It ranks moderate in potential water quality benefits, low in native species value, and provides no sport fishery value to the Blackfoot River, giving Arkansas Creek a low total ranking on the restoration priority list. Arkansas Creek supports pure resident WSCT and brook trout in its lower and middle reaches. WSCT densities are low but increase slightly in the upstream direction, while brook trout densities are low. Fisheries impairments include: 1) elevated stream

sediment levels from poor road drainage, 2) extensive channel alterations in mid-to lower reaches, 3) livestock induced bank degradation, and 4) dewatering.

TMDL Issues
Not listed

Dewatering Issues
The lower two miles of Arkansas Creek is on the dewatered stream list due to irrigation.

Native Species Issues
WSCT genetic composition: tested 100% WSCT

Restoration Activities
Past Restoration
None
Current/Planned Restoration
The NRCS, Five Valleys Land Trust and the principle landowner are planning a comprehensive stream and wetland restoration project in the lower reaches of Ashby Creek. This project may involve lower Arkansas Creek.

Monitoring Activities
Past Monitoring
FWP inventoried fish populations 2000 and measured stream temperatures in 2002.
Ongoing Monitoring
None
Planned Future Monitoring
Additional monitoring will be developed in conjunction with restoration plans.

BUFFALO GULCH: Priority - Low

Description
Buffalo Gulch, a small 2nd order tributary to the Nevada Creek Reservoir, flows ~7 miles through both public (National Forest) in headwaters and private land in the lower ~4 miles of stream. Buffalo Gulch ranks high in potential water quality benefits, moderate in native species value, and provides no sport fishery value to the Blackfoot River, resulting in a low total rank for restoration priority. Lower Buffalo Gulch supports moderate densities of resident WSCT and low densities of rainbow trout. Fisheries impairments in the lower ~3 miles of stream include 1) livestock-induced stream bank damage, 2) riparian vegetation suppression and 3) lack of complex fish habitat (instream wood).

TMDL Issues
Listing History: 2000, 2002, & 2004
Listed causes of impairment: Siltation and habitat alterations.

Dewatering Issues
Unknown

Native Species Issues
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration
None

Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP inventoried fish population, measured flows and collected water temperature data in 2001.

Ongoing Monitoring
None although a road sediment and culvert survey on private land is recommended.

Planned Future Monitoring
None

CALIFORNIA GULCH: Priority - Low

Description
California Gulch, a small 2nd order tributary to Buffalo Gulch in the upper Nevada Creek watershed, flows ~3.5 miles through both public (National Forest) and private land in the lower ~2 miles. High potential water quality benefits, low native species value, low social rank, and no sport fishery value to the Blackfoot River, ranks California Gulch low on the restoration priority list for non-project streams. California Gulch supports only resident WSCT. Fisheries impairments in the lower ~2 miles include 1) lack of complex fish habitat (instream wood), 2) livestock-induced stream bank degradation and riparian vegetation suppression, and 3) reduced instream flows from irrigation.

TMDL Issues
Not listed; tributary to Buffalo Gulch a 303(d) listed stream

Dewatering Issues
Unknown

Native Species Issues
WSCT genetic composition: untested

Restoration Activities

Past Restoration
None

Current/Planned Restoration
None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations and measured stream flow in 2001.

Ongoing Monitoring

None

Planned Future Monitoring

None

COTTONWOOD CREEK (Trib. to Douglas Creek): Priority - Low

Description

Cottonwood Creek, a 2nd order tributary to lower Douglas Creek, flows ~ 18 miles first through public (BLM) and then private agricultural land in the lower ~8 miles of the stream. Overall, it ranks low on the restoration priority list. A low native species value, low social ranking, and lack of sport fishery value generate its low total and biological ranking. Due to dewatering, potential for a reduction in sediment, temperature and nutrients, Cottonwood Creek ranks high in potential water quality benefits. The upper reaches support high densities of resident WSCT and brook trout. Lower Cottonwood Creek supports only long nose suckers. Fisheries impairments, located in the lower reaches, include: 1) livestock induced stream bank degradation and riparian vegetation suppression, 2) lack of complex fish habitat (instream wood), 3) undersize road crossing culverts causing erosion, and 4) dewatering.

TMDL Issues

Listing history: 1996, 2000, 2002, & 2004

Listed causes of impairment: Siltation, thermal modification, nutrients, salinity, TDS, chlorides.

Dewatering Issues

The lower five miles of Cottonwood Creek is on the dewatered stream list due to irrigation.

Native Species Issues

WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration

Some restoration work has occurred in the lower basin. Projects involved riparian grazing improvements, instream restoration and fish ladders at diversions.

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish population since 1998 and 2000 and measured water temperatures and stream flows in 2000.

Ongoing Monitoring
None
Planned Future Monitoring
None

JEFFERSON CREEK: Priority - Low

Description
Jefferson Creek, a 2nd order tributary to Nevada Creek, drains the eastern slopes of Dalton Mountain and flows ~7.5 miles entirely through private land except for a section of public (BLM) land between mile 4 and 5. Jefferson Creek ranks low in the total ranking and restoration priority list. This rank is due a low (single) native species value, lack of sport fishery value to the Blackfoot River and low social and financial rank. Jefferson Creek ranked high in potential to improve downstream water quality due to its impaired condition. Jefferson Creek supports populations of resident WSCT and rainbow trout. Rainbow trout are found in low numbers in lower reaches. WSCT are found throughout the drainage in generally low densities. Fisheries impairments in the upper and middle reaches include: 1) poor road crossings (crushed undersized culvert), 2) channel alterations (mining disturbance), 3) lack of instream complexity, and 4) low instream flow.

TMDL Issues
Listing history: 1996, 2000, 2002, & 2004
Listed causes of impairment: Flow and habitat alterations and siltation.

Dewatering Issues
The lower mile of Jefferson Creek is on the dewatered stream list due to irrigation.

Native Species Issues
WSCT genetic composition: tested 93% WSCT

Restoration Activities

Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP inventoried fish populations and measured stream temperatures and stream flow in 2001.
Ongoing Monitoring
None
Planned Future Monitoring
None

NEVADA CREEK (Lower): Priority - Low

Description

Nevada Creek below the reservoir is a large 3rd order tributary to the middle Blackfoot River that flows ~33 miles exclusively through private ranch land. Lower Nevada Creek ranks low on the restoration priority and total rank list due to the lack of native species and sport fishery values to the Blackfoot River. Although Nevada Creek ranks low overall, it ranked high for potential to increase flow and potential to improve downstream water quality to the Blackfoot River. Salmonids (rainbow trout and brown trout) inhabit lower Nevada Creek in very low densities immediately below Nevada Creek reservoir, but are absent from lower Nevada Creek. Fisheries-related impairments, located throughout the drainage, include: 1) irrigation impacts (entrainment, dewatering), 2) channel alterations, 3) lack of instream complexity, 4) degraded riparian vegetation resulting from excessive livestock access to riparian areas, and 5) low water quality. In 2003, low levels of whirling disease were detected in Nevada Creek.

TMDL Issues

Listing history: 1996, 2000, 2002, & 2004

Listed causes of impairments: Flow and habitat alterations, nutrients, siltation, metals, thermal modifications, and suspended solids.

Dewatering Issues

The lower 25.3 miles of lower Nevada Creek is on the dewatered stream list due to reservoir management and irrigation.

Native Species Issues

WSCT not detected in lower Nevada Creek

Restoration Activities

Past Restoration

Grazing related projects have been completed in some portions of lower Nevada Creek, Fish ladder were installed on several irrigation diversions.

Current/Planned Restoration

Restoration activities are ongoing and focus on grazing issues.

Monitoring Activities

Past Monitoring

FWP inventoried fish population in 1989 and 1990 and resurveyed sample sites in 1994 and 2000. FWP measured stream temperatures annually from 1998 through 2004 and stream flows in 1989, 2000 and 2001. A USGS gauging station monitors stream flows near the mouth of Nevada Creek and a DNRC gauging station monitors flows below the reservoir. FWP tested for whirling disease below the reservoir in 2003. An ambient water quality survey was completed in 1989 (Ingman et al. 1990).

Ongoing Monitoring

Water temperature assessments are ongoing

Planned Future Monitoring

Periodic fish population will be completed.

WASHINGTON CREEK: Priority - Low

Description

Washington Creek, a 2nd order tributary to upper Nevada Creek, flows ~11 miles through mixed public (National Forest, BLM) and private ownership. Washington Creek ranks low for non-project streams on the restoration priority and total rank list. This low rank is due to: 1) low native species value, 2) lack of sport fishery value to the Blackfoot River, and 3) low social and financial rank. Washington Creek ranks high for potential to improve downstream water quality if restored due to its impaired condition. Washington Creek contains resident WSCT and resident brook trout throughout the drainage. Densities of WSCT decrease in the downstream direction. Brook trout are present in low densities from a fish barrier (mile 7.2) downstream to the mouth. Fisheries impairments are extensive and include: 1) channel alterations related to past placer mining irrigation, 2) channel alterations near the mouth, 3) lack of instream complexity, 4) stream bank damages resulting from excessive livestock access to riparian areas, and 5) at least one road crossing at site identified by the USFS.

TMDL Issues

Listing history: 1996, 2000, 2002, & 2004

Listed causes of impairment: Flow and habitat alterations and siltation.

Dewatering Issues

The lower mile of Washington Creek in on the dewatered stream list due to irrigation.

Native Species Issues

Isolet WSCT population,

WSCT genetic composition: untested

Restoration Activities

Past Restoration

Patented mining reclamation in 2001 and 2002

Current/Planned Restoration

None although a potential project would be the improvement of a fish passage barrier located at the upper end of the patented mining claim to prevent upstream invasion of brook trout.

Monitoring Activities

Past Monitoring

FWP inventoried fish populations, measured stream temperatures and collected stream flow data in 2001.

Ongoing Monitoring

None

Planned Future Monitoring

None

BARTLETT CREEK: Priority - Low

Description

Bartlett Creek, a 1st order tributary to Alice Creek in the upper Blackfoot River watershed, flows ~7 miles through private land and a small portion of public land (National Forest) in the upper reaches. Bartlett Creek ranks low on the restoration priority list. This low ranking is the result of low native species value, lack of sport fishery value and low potential downstream water quality benefits to the Blackfoot River. Bartlett Creek supports populations WSCT and brook trout. Fish densities are very low for both species in the lower reaches. High densities of brook trout were the only species found in the middle reaches. Fisheries impairments in lower Bartlett Creek include lack of complex fish habitat (instream wood) and localized recreational degradation (campsites) to stream banks.

TMDL Issues

Not listed

Dewatering Issues

Natural dewatering occurs in the middle reaches the extent of which is unknown.

Native Species Issues

WSCT genetic composition: tested 98.8% WSCT

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 1999

Ongoing Monitoring

None

Planned Future Monitoring

None

FRAZIER CREEK: Priority - Low

Description

Frazier Creek, a small 2nd tributary to the middle Blackfoot River, flows ~3.6 miles through both public (BLM) and private land. The private land is located in the lower two-thirds of the stream. Frazier ranks low on the restoration priority list due to its low native species value, low social and financial rank, lack of sport fishery value to the Blackfoot River and a technical inability to address the entire stream system. However, Frazier has moderate potential for water quality benefits and potential to increase stream flows to Blackfoot River. Frazier Creek supports a disjunct resident population of genetically pure WSCT and no other fish species. Fisheries impairments include: 1) reduced instream flows, 2) channel alterations

(two instream reservoirs), 3) stream channel fragmentation preventing fish passage, and 4) livestock grazing impacts to riparian areas.

TMDL Issues
Listing history: 1996, 2000, 2002, & 2004
Listed causes of impairment: Flow and habitat alterations.

Dewatering Issues
The lower 1.5 miles of Frazier Creek is dewatered stream list due to irrigation.

Native Species Issues
Isolate WSCT Population
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP inventoried fish populations in 2000 and measured stream temperatures near the mouth in 2002 and 2003.
Ongoing Monitoring
None
Planned Future Monitoring
None

GALLAGHER CREEK: Priority - Low

Description
Gallagher Creek, a 2nd order tributary to upper Nevada Creek, flows ~7 miles through both public (National Forest) land in headwaters and private land downstream of mile ~3. Low native species value, low water quality benefits, and no sport fishery value to the Blackfoot River, ranks Gallagher Creek low on the restoration priority list. Gallagher Creek supports only resident WSCT. The lower reaches support low densities of WSCT that increase to moderate numbers in middle reaches. Fisheries impairments in lower reaches include localized livestock-induced stream bank damage and an undersized culvert.

TMDL Issues
Listing history: 1996, 2000, 2002, & 2004
Listed causes of impairments: Flow and habitat alterations

Dewatering Issues
The lower three miles of Gallagher Creek is on dewatered stream list due to irrigation.

Native Species Issues

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish populations and measured stream flow in 2001.
Ongoing Monitoring
None
Additional Planned Monitoring
None

GAME CREEK: Priority - Low

Description
Game Creek, a 1st order tributary to Union Creek, flows ~5.6 miles through industrial forest (Plum Creek) and State land in the headwaters and private ranch land downstream of mile ~2. Low native species value, low social ranking, lack of sport fishery value to the Blackfoot River and moderate potential in water quality improvement benefits, ranks Game Creek low on the restoration and total rank priority list. Lower Game Creek supports resident WSCT. Fisheries impairments in middle reaches include localized livestock induced stream bank damage and a perched culvert limiting fish passage.

TMDL Issues
Not listed

Dewatering Issues
Unknown

Native Species Issues
WSCT genetic composition: tested 98.7% WSCT

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish populations in 2000.

Ongoing Monitoring
None
Planned Future Monitoring
None

HUMBUG CREEK: Priority - Low

Description
Humbug Creek, a small 2nd order disjunct tributary to Poorman Creek, is located on the south side of the Lincoln Valley. Humbug Creek flows ~3 miles exclusively through private land. Humbug Creek ranks low in the total rank and restoration priority list. This rank is due to a low native species value, no sport fishery value to the Blackfoot River, low potential to improve downstream water quality and a moderate social and financial rank. Humbug Creek supports moderate densities of resident WSCT. Fisheries impairments in the lower reaches include: 1) dewatering, 2) channel alterations, 3) degraded riparian vegetation, 4) excessive livestock access to stream banks, and 5) a small mine in the South Fork, which contributes to channel instability.

TMDL Issues
Not listed

Dewatering Issues
The lower mile of Humbug Creek is on the dewatered stream list due to natural losses.

Native Species Issues
Isolet WSCT population
WSCT genetic composition: tested 100% WSCT

Restoration Activities
Past Restoration
None
Current/Planned Restoration
A project is being planned to convert irrigation form the Blackfoot River to a groundwater source.

Monitoring Activities
Past Monitoring
FWP inventoried fish populations in 1995.
Ongoing Monitoring
None
Planned Future Monitoring
None

SHINGLE MILL CREEK: Priority - Low

Description
Shingle Mill Creek, a 1st order tributary to upper Nevada Creek, originates on the western slope of Nevada Mountain. Shingle Mill Creek flows ~5.5 miles mostly through public

(National Forest) with private ranch land in lower reaches. Shingle Mill Creek ranks low on the restoration and total rank list due to low native species value, low potential for improving water quality and lack of sport fishery value to the Blackfoot River. Shingle Mill Creek supports resident WSCT, with population densities that decrease in the downstream direction. Fisheries impairments in the lower reaches include irrigation impacts (dewatering and passage) and excessive livestock access to stream banks.

TMDL Issues
Not listed: Tributary to the 303(d) listed Nevada Creek

Dewatering Issues
Unknown

Native Species Issues
WSCT genetic composition: tested 100% WSCT

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish populations in 2001 and measured stream flows in 2001.
Ongoing Monitoring
None
Planned Future Monitoring
None

BEAR CREEK (Trib. to the North Fork) Priority- Moderate

Description
Bear Creek, a small spring-fed 2nd order disjunct tributary of the North Fork Blackfoot River, flows ~2 miles through private land. Bear Creek ranks low on the restoration priority list, despite bull trout core area status. Bear Creek has a moderate native species value due to core area status, but lacks potential water quality benefits and provides no sport fishery value. Bear Creek supports low densities of genetically unaltered resident WSCT and no other fish species. Fisheries impairments in lower Bear Creek include dewatering and possibly WSCT entrainment to irrigation canals.

TMDL Issues
Not listed

Dewatering Issues
Both natural and human-caused dewater approximately one mile of lower Bear Creek.

Native Species Issues
Isolet WSCT population
WSCT genetic composition: tested 100% WSCT

Restoration Activities

Past Restoration
None

Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP inventoried fish population in 1998.

Ongoing Monitoring
None

Planned Future Monitoring
None

STRICKLAND CREEK: Priority - Low

Description

Strickland Creek, a 2nd order tributary to Halfway Creek, originates on the northern slopes of Gravely Mountain in the Garnet Mountain range. Strickland Creek flows ~6.5 miles exclusively through private ranch land. Strickland Creek ranks low in total rank and restoration priority due to lack of native species, no sport fishery value to the Blackfoot River, and low social and financial rank. However, Strickland Creek has high potential to improve downstream water quality. No salmonids were collected in lower Strickland Creek when it was sampled in 2001. Fisheries impairments on lower Strickland Creek include lack of instream complexity and degraded stream banks from excessive livestock access to riparian areas.

TMDL Issues
Not listed

Dewatering Issues
Unknown

Native Species Issues
No native salmonids present

Restoration Activities

Past Restoration
None

Current/Planned Restoration
None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations and measured stream flow in 2001.

Ongoing Monitoring

None

Additional Planned Monitoring

None

WARD CREEK: Priority - Low

Description

Ward Creek, 2nd order tributary to the North Fork of the Blackfoot River, originates on Arrastra Mountain and flows ~17 miles through mixed ownership, with the lower ~6 miles exclusively on private land. Ward Creek is a tributary to two large lakes (Browns and Kleinschmidt Lakes) in the Blackfoot Valley. Ward Creek ranks low for restoration priority and total rank. This low rank is due to lack of native species, no sport fishery value to the Blackfoot River and low social and financial rank. Ward Creek ranks high in potential to improve downstream water quality. Ward Creek does not support native salmonids, but rather low densities of resident brook trout in lower reaches and moderate densities in upper reaches. Fisheries impairments are extensive and include lack of instream complexity and degraded stream banks and riparian areas resulting from excessive riparian livestock access.

TMDL Issues

Listing history: 1996, 2000, 2002, & 2004

Listed causes of impairment: Habitat and flow alterations and siltation.

Dewatering Issues

Unknown

Native Species Issues

No native salmonids present

Restoration Activities

Past Restoration

None

Current/Planned Restoration

Grazing management changes area planned for approximately one mile of stream.

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 2001.

Ongoing Monitoring

None

Planned Future Monitoring

None

INDIAN CREEK: Priority - Low

Description

Indian Creek, a 2nd order tributary to the Nevada Creek Reservoir, flows ~4.5 miles through mostly public (BLM) land and a small portion of private land near the mouth. Indian Creek ranks low on the total ranking and restoration priority list due to low native species value, no sport fishery value to the Blackfoot River, the lack of potential to improve water quality and a moderate social ranking. Indian creek supports resident WSCT in low densities within the lower to middle reaches. Fisheries impairments include lack of instream complexity in the lower reaches.

TMDL Issues

Not listed; Tributary to the 303(d) listed Nevada Creek

Dewatering Issues

Unknown

Native Species Issues

WSCT genetic composition: untested

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations and measured stream flow in 2001.

Ongoing Monitoring

None

Planned Future Monitoring

None

WARREN CREEK (East Fork from Doney Lake): Priority - Low

Description

East Fork Warren Creek, a 2nd order tributary stream to Warren Creek, drains the south-eastern slopes of Ovando Mountain. The upper one mile of stream is on public land (State) then flows predominately south ~3.8 miles through private industrial forest land (Plum Creek) and ranch land to its confluence with the main-stem Warren Creek (mile 8.6). At stream mile 1.6, a small (0.45 mile) effluent tributary stream from Doney Lake enters. East Fork Warren Creek ranks low on the restoration priority and total ranking list because it lacks sport fishery value and potential to increase flows to the Blackfoot River. However, it ranked moderate in potential to improve downstream water quality. East Fork Warren Creek supports low numbers of WSCT and resident brook trout in its lower reaches. Fishery impairments include channel alterations and excessive livestock grazing impacts to riparian vegetation.

TMDL Issues
Not listed

Dewatering Issues
Unknown

Native species issues
No evidence of WSCT reproduction

Restoration Activities

Past Restoration
None

Current/Planned Restoration Activities
None

Monitoring Activities

Past Monitoring
FWP conducted fish population surveys in 2004.

Ongoing Monitoring
None

Planned Future Monitoring
None

BURNT BRIDGE CREEK: Priority - Low

Description
Burnt Bridge Creek, a small 1st order tributary to Gold Creek in the lower Blackfoot River watershed, flows ~2 miles through both private land and a small portion of public land near the mouth. Burnt Bridge Creek ranks low on the restoration priority list and although located in a bull trout core area, Burnt Bridge Creek also ranks low in native species value. Burnt Bridge ranked low in biological priority due to low potential to improve downstream water quality and also currently provides no sport fishery value to the Blackfoot River. Burnt Bridge Creek supports only resident brook trout in low densities. Fisheries impairments include: 1) an entrenched and altered stream channel, 2) elevated stream sediment levels from poor road drainage, 3) undersized culverts, 4) localized areas of riparian vegetation suppression, and 5) reduced instream flows from irrigation.

TMDL Issues
Not listed

Dewatering Issues
One mile of Burnt Bridge is on the dewatered stream list due to irrigation.

Native Species Issues
Bull trout core area stream
WSCT not detected

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations in 1998.

Ongoing Monitoring

None

Planned Future Monitoring

None

CLEAR CREEK: Priority - Low

Description

Clear Creek, a small 2nd order tributary to Buffalo Gulch in the upper Nevada Creek watershed, flows ~4 miles through both public (National Forest) in the upper drainage and private land downstream of mile ~1.5. Clear Creek ranked low in restoration priority and total rank. Clear Creek's low priority is generated from low native species value, no sport fishery value to the Blackfoot River and lack of potential downstream water quality benefits. Clear Creek supports a resident WSCT population. Densities are low throughout the drainage, although, numbers increase in middle reaches. Fisheries impairments include at least two undersized culverts in the watershed and minor livestock damage to riparian vegetation in the middle reaches.

TMDL Issues

Not listed; tributary to Buffalo Gulch a 303(d) listed stream

Dewatering Issues

Unknown

Native Species Issues

Restoration Activities

Past Restoration

None

Current/Planned Restoration

None

Monitoring Activities

Past Monitoring

FWP inventoried fish populations and measured flow in 2001.

Ongoing Monitoring

None

Planned Future Monitoring
None

FRAZIER CREEK, North Fork: Priority - Low

Description
North Fork of Frazier Creek, a small 1st order tributary to Frazier Creek in the middle Blackfoot River watershed, flows ~2 miles through private timber and ranch land. The North Fork ranks low on the restoration priority list because of low native species value, low water quality benefits, no sport fishery value to the Blackfoot River and a technical inability to address the entire stream system. The North Fork supports a genetically pure population of resident WSCT. This population is disjunct from both upper Frazier Creek and the Blackfoot River due to instream irrigation reservoirs above and below the North Fork confluence. Fisheries impairments include: 1) fragmentation of stream reaches, 2) irrigation (entrainment and low flows), and 3) localized livestock-induced stream bank damage.

TMDL Issues
Not listed

Dewatering Issues
The lower 0.5 miles of NF Frazier Creek is on the dewatered stream list due to irrigation.

Native Species Issues
Isolet WSCT
WSCT genetic composition: tested 100% WSCT

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP conducted fish population surveys in 1999 and 2002.
Ongoing Monitoring
None
Planned Future Monitoring
None

GLEASON CREEK: Priority - Low

Description
Gleason Creek, a 1st order tributary to upper Nevada Creek, flows ~4.4 miles entirely through public (National Forest) land. With low native species value, no potential water quality benefits, and no sport fishery value to the Blackfoot River, Gleason Creek ranks low on the restoration and total rank priority list. FWP surveys report Gleason Creek supports low densities of resident WSCT with no other fish species. The USFS observed as single

bull trout in a snorkeling survey in lower Gleason Creek in 1999. Fisheries impairments near the mouth of Gleason Creek include a perched culvert limiting fish passage and mining impacts.

TMDL Issues
Not listed; Tributary to the 303(d) listed Nevada Creek

Dewatering Issues
None known

Native Species Issues
WSCT genetic composition: untested. USFS observed one bull trout during a 1999 survey

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP inventoried fish populations and measured stream flow in 2001.
Ongoing Monitoring
None
Planned Future Monitoring
None

MCDERMOTT CREEK: Priority - Low

Description
McDermott Creek, a small 1st order stream, drains the southwest slopes of Mineral Hill in the Scapegoat Wilderness. This stream flows south 3.6 miles through public (National Forest) and private land before emptying into northern end of Coopers Lake. McDermott Creek received a low ranking on the restoration priority and total rank list due to a moderate native species rank, and the lack of any known impairments. McDermott Creek supports moderate densities of brook trout and very low numbers of WSCT.

TMDL Issues
Not listed

Dewatering Issues
Unknown

Native Species Issues
Bull trout core area stream
WSCT genetic composition: untested

Restoration Activities

Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP conducted fish population surveys in 2001.
Ongoing Monitoring
None
Planned Future Monitoring
None

CHIMNEY CREEK (Nevada Creek trib. via Lincoln Slough): Priority - Low

Description
Chimney Creek, a small 1st order tributary to Lincoln Slough in the lower Nevada Creek watershed, flows ~5 miles through both public (National Forest) land in the upper drainage and private ranch land in the lower ~2.5 miles of stream. Chimney Creek ranks low in total rank due to low native species value, low social rankings, no sport fishery value, and a technical inability to address the entire stream system. Chimney Creek supports a small, low density, disjunct population of resident WSCT in middle reaches. Fisheries impairments in the lower 2 miles include: 1) localized livestock induced stream bank degradation, 2) dewatering from irrigation, 3) channel alterations, 4) undersized culverts, and 5) irrigation canals creating barriers to fish passage.

TMDL Issues
Not listed

Dewatering Issues
The lower 0.5 miles is on the dewatered stream list due to irrigation.

Native Species Issues
WSCT genetic composition: tested 100% WSCT
Isolet WSCT population

Restoration Activities

Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities

Past Monitoring
FWP conducted fish population surveys in 2000.

Ongoing Monitoring
None
Planned Future Monitoring
None

SMITH CREEK: Priority - Low

Description
Smith Creek is a small 1st order tributary stream to Camas Creek, a tributary to Union Creek in the Garnet Mountain range in the lower Blackfoot River watershed. Smith Creek flows~1.1 miles exclusively through private ranch and industrial forest land (Plum Creek). It ranks low on the restoration priority and total rank list because of its low native species value, no sport fishery value to the Blackfoot River, and low water quality improvement ranking. Smith Creek supports high densities of resident WSCT. Fisheries impairments include: 1) areas of livestock grazing impacts to riparian vegetation and stream banks, 2) road crossing (undersized culvert) and 3) road drainage.

TMDL Issues
Not listed

Dewatering Issues
Unknown

Native Species Issues
WSCT genetic composition: tested 99% WSCT

Restoration Activities
Past Restoration
None
Current/Planned Restoration
None

Monitoring Activities
Past Monitoring
FWP conducted fish population surveys in 2000 and 2001 near the mouth.
Ongoing Monitoring
None
Planned Future Monitoring
None

APPENDIX E

FISHERIES PRIORITIZATION MATRIX

Appendix E. Fisheries Prioritization Matrix

			Biological/Resource Benefits-150 possible points																				Social and Financial Considerations-50 possible points						
Stream Name	Project stream	Impaired	Bull trout spawning present	Bull trout rearing present	Bull trout core area	Fluvial WSCT present	Resident WSCT present	Native Species Totals	Native Species Ranking	Sport Fishery value to BFR (Multi	Sport Fishery value to BFR (Single	Technically able to address entire stream system	Provide increased stream flows to BFR	Dewatered (H, N, B)	Improves downstream water Quality by reducing Sediment	Improves downstream water Quality by reducing Temp	Improves downstream water Quality by [illegible]	Water Quality Score	TMDL stream	Water Quality Ranking	Bio score	Bio ranking	Land owner/ Land manager cooperation	Restoration feasibility-cost/mile	Demo/ Edu value	Social score	Social ranking	Total Score	Total Rank
Alice Creek	N	Y	20	10		20		50	2		10	20			10			10		3	90	6	15	20	5	40	2	130	10
Arkansas Creek	N	Y					10	10	6			20		H	10	10		20		2	50	10	15	10	10	35	2	85	19
Arrastra Creek	N	Y	20	10		20		50	2	20		20		N				0	Y	4	90	6	10	5	10	25	3	115	13
Ashby Creek	Y	Y					10	10	6			20		H	10	10	10	30	Y	1	60	9	20	5	10	35	2	95	17
Bartlett Creek	N	Y					10	10	6			20				10		10		3	40	11	15	20	5	40	2	80	20
Basin Spring Creek	Y	N				20		20	5		10	20			10			10		3	40		20	20	10	50	1	100	16
Bear Creek Trib to N F	N	Y			10		10	20	5			20		B				0		4	40	11	15	10	10	35	2	75	21
Bear Creek (R M 12 2)	Y	Y		10		20		30	4	20		20			10			10		3	80	7	20	20	5	45	1	125	11
Bear Creek (R M 37 5)	N	Y				20		20	5		10	20						0		4	50	10	20	20	5	45	1	95	17
Beaver Creek	Y	Y		10		20		30	4	20		20	20		10	10	10	30		1	120	3	15	20	5	40	2	160	4
Belmont Creek	Y	Y	20	10	10	20		60	1	20		20			10	10		20	Y	2	120	3	20	10	10	40	2	160	4
Black Bear Creek	N	Y						0	7			20			10	10	10	30	Y	1	50	10	20	20	10	50	1	100	16
Blackfoot River 1	N	Y		10		20		30	4			20						0	Y	4	50	10	20	20	10	50	1	100	16
Blackfoot River 2	N	Y		10		20		30	4			20			10			10	Y	3	70	8	20	20	5	45	1	115	13
Blackfoot River 3	N	Y		10		20		30	4			20	20	B	10	10	10	30	Y	1	100	5	10	20	5	35	2	135	9
Blackfoot River 4	N	Y		10		20		30	4			20	20	B	10	10		20	Y	2	90	6	10	20	5	35	2	125	11
Blackfoot River 5	Y	Y	20	10		20		50	2	20		20			10			10	Y	3	110	4	10	10	5	25	3	135	9
Blackfoot River 6	Y	Y	20	10		20		50	2	20		20		B	10			10	Y	3	110	4	10	5	10	25	3	135	9
Blanchard Creek	Y	Y				20		20	5	20		20	20	H	10	10	10	30	Y	1	110	4	15	10	10	35	2	145	7
Buffalo Gulch	N	Y					10	10	6			20			10	10	10	30	Y	1	60	9	10	10	5	25	3	85	19
Burnt Bridge Creek	N	Y			10			10	6			20		H	10			10		3	40	11	10	10	5	25	3	65	23
California Gulch	N	Y					10	10	6			20			10	10	10	30		1	60	9	10	10	5	25	3	85	19
Camas Creek	N	Y					10	10	6			20			10	10	10	30	Y	1	60	9	10	20	5	35	2	95	17
Chamberlain Creek	Y	Y		10		20		30	4	20		20		H	10			10	Y	3	80	7	20	20	10	50	1	130	10
Chamberlain EF	Y	Y				20		20	5		10	20			10			10		3	60	9	20	20	5	45	1	105	15
Chamberlain WF	Y	Y				20		20	5		10	20			10			10		3	60	9	20	10	5	35	2	95	17
Chicken Creek	N	Y					10	10	6			20			10	10	10	30		1	60	9	10	20	5	35	2	95	17
Chimney Cr (Douglas)	N	Y					10	10	6			20			10	10	10	30		1	60	9	10	20	5	35	2	95	17
Chimney Cr (Nevada)	N	Y					10	10	6					H				0		4	10	14	15	5	5	25	3	35	24
Clear Creek	N	Y					10	10	6			20						0		4	30	12	10	20	5	35	2	65	23
Clearwater River	Y	Y				20		20	5	20		20	20	H				0	Y	4	80	7	10	10	5	25	3	115	13
Copper Creek	N	Y	20	10	10	20		60	1	20		20						0		4	100	5	20	20	5	45	1	145	7
Cottonwood Cr (Nev)	Y	Y					10	10	6			20		H	10	10	10	30	Y	1	60	9	10	10	5	25	3	85	19
Cottonwood Cr (R M 43)	Y	Y	20	10	10	20		60	1	20		20	20	B	10			10	Y	3	130	2	15	10	10	35	2	165	3
Dick Creek	Y	Y			10	20		30	4	20		20	20	B	10	10	10	30		1	120	3	15	20	10	45	1	165	3
Douglas Creek	Y	Y					10	10	6			20	20	H	10	10	10	30	Y	1	80	7	10	20	5	35	2	115	13
Dry Creek	Y	N		10	10	20		40	3	20		20		N				0		4	80	7	20	20	5	45	1	125	11
Dunham Creek	Y	Y	20	10	10	20		60	1	20		20		B	10			10		3	110	4	20	10	10	40	2	150	6
East Twin Creek	Y	Y		10		20		30	4	20		20			10			10		3	80	7	15	20	5	40	2	120	12
Elk Creek	Y	Y				20		20	5	20		20	20	H	10	10	10	30	Y	1	110	4	15	10	5	30	3	140	8
Finn Creek	N	Y						0	7			20			10	10	10	30		1	50	10	15	20	5	40	2	90	18
Fish Creek	N	Y				20		20	5		10	20	20	H				0		4	70	8	15	20	10	45	1	115	13
Frazier Creek	N	Y					10	10	6				20	H	10	10		20	Y	2	50	10	15	5	10	30	3	80	20
Frazier Creek, NF	N	Y					10	10	6					H	10			10		3	20	13	20	20	5	45	1	65	23
Gallagher Creek	N	Y					10	10	6			20		H	10			10	Y	3	40	11	15	20	5	40	2	80	20
Game Creek	N	Y					10	10	6			20			10	10		20		2	50	10	5	20	5	30	3	80	20
Gleason Creek	N	Y					10	10	6			20						0		4	30	12	20	10	5	35	2	65	23
Gold Creek	Y	Y	20	10	10	20		60	1	20		20			10			10		3	110	4	15	20	5	40	2	150	6
Gold Creek, W F	N	Y	20	10	10	20		60	1	20		20			10			10		3	110	4	20	20	5	45	1	155	5
Grantier Spring Cr	Y	N		10		20		30	4	20								0		4	50	10	20	20	10	50	1	100	16
Halfway Creek	N	[illegible]						0	7			20			10	10	10	30		1	50	10	10	10	10	40	2	90	18
Hogum Creek	N	Y		10			10	20	5	20		20			10			10		3	70	8	10	20	5	35	2	105	15
Hoyt Creek	Y	Y					10	10	6	20		20	20	H	10	10	10	30		1	100	5	15	20	5	40	2	140	8
Humbug Creek	N	Y					10	10	6			20		B	10			10		3	40	11	15	20	5	40	2	80	20
Indian Creek	N	Y					10	10	6			20						0		4	30	12	15	20	5	40	2	70	22
Jefferson Creek	N	Y					10	10	6			20		H	10	10	10	30	Y	1	60	9	10	5	10	25	3	85	19
Johnson Creek	Y	N		10		20		30	4	20		20			10			10		3	80	7	15	20	5	40	2	120	12
Keep Cool Creek	N	Y				20		20	5	20		20			10	10		20		2	80	7	15	20	5	40	2	120	12

Appendix E. Fisheries Prioritization Matrix

			Biological/Resource Benefits-150 possible points																				Social and Financial Considerations-50 possible points						
Stream Name	Project stream	Impaired	Bull trout spawning present	Bull trout rearing present	Bull trout core area	Fluvial WSCT present	Resident WSCT present	Native Species Totals	Native Species Ranking	Sport Fishery value to BFR (Multi	Sport Fishery value to BFR (Single	Technically able to address entire stream system	Provide increased stream flows to BFR	Dewatered (H, N, B)	Improves downstream water Quality by reducing Sediment	Improves downstream water Quality by reducing Temp	Improves downstream water Quality by reducing	Water Quality Score	TMDL stream	Water Quality Ranking	Bio score	Bio ranking	Land owner/ Land manager cooperation	Restoration feasibility-cost/mile	Demo/ Edu value	Social score	Social ranking	Total Score	Total Rank
Kleinschmidt Cr	Y	Y		10	10	20		40	3	20		20			10	10	10	30	Y	1	110	4	15	20	10	45	1	155	5
Landers Fork	N	Y	20	10	10	20		60	1	20		20	20	N	10	10		20	Y	2	140	1	15	5	10	30	3	170	2
Lincoln Spring Cr	N	Y				20		20	5	20		20	20				10	10		3	90	6	10	5	10	25	3	115	13
Little Fish Creek	N	Y				20		20	5		10	20	20	H	10			10		3	90	6	15	20	10	45	1	135	9
Lodgepole Creek	N	N	20	10	10		10	50	2		10	20						0		4	80	7	20	20	5	45	1	125	11
McCabe Creek	Y	Y			10	20		30	4		10	20	20	H	10			10		3	90	6	20	20	5	45	1	135	9
McDermott Creek	N	N			10		10	20	5									0		4	20	13	20	20	5	45	2	65	23
McElwain Creek	Y	Y					10	10	6		10	20	20	H	10	10	10	30	Y	1	90	6	10	20	10	40	2	130	10
Mitchell Creek	N	Y					10	10	6			20			10		10	20		2	50	10	15	20	5	40	2	90	18
Monture Creek	Y	Y	20	10	10	20		60	1	20		20		N	10	10	10	30	Y	1	130	2	15	20	10	45	1	175	1
Moose Creek	N	Y				20		20	5		10	20			10			10		3	60	9	20	20	5	45	1	105	15
Murray Creek	N	Y					10	10	6			20		H	10	10	10	30	Y	1	60	9	10	20	5	35	2	95	17
Nevada Cr (lower)	Y	Y						0	7			20	20	H	10	10	10	30	Y	1	50	10	15	10	10	35	2	85	19
Nevada Cr (upper)	N	Y	20	10			10	40	3					N	10	10	10	30	Y	1	70	8	10	20	10	40	2	110	14
Nevada Spring Cr	Y	Y				20		20	5			20	20		10	10	10	30	Y	1	90	6	20	5	10	35	2	125	11
N F Blackfoot R	Y	Y	20	10	10	20		60	1	20		20	20	B	10	10		20	Y	2	140	1	15	10	10	35	2	175	1
Pearson Creek	Y	Y				20		20	5		10	20			10	10		20	Y	2	70	8	20	20	10	50	1	120	12
Poorman Creek	Y	Y	20	10		20		50	2	20		20	20	B	10	10	10	30		1	140	1	10	10	10	30	3	170	2
Rock Creek	Y	Y		10	10	20		40	3	20		20	20	B	10	10	10	30	Y	1	130	2	15	5	10	30	3	160	4
Salmon Creek	Y	Y		10	10	20		40	3	20		20	20	H				0		4	100	5	15	10	5	30	3	130	10
Saurekraut Creek	N	Y		10		20		30	4	20		20			10	10		20		2	90	6	15	5	10	30	3	120	12
Seven up Pete Cr	N	Y				20		20	5		10	20			10			10		3	60	9	15	20	5	40	2	100	16
Shanley Creek	Y	Y			10		10	20	5	20		20		H	10	10	10	30		1	90	6	15	20	5	40	2	130	10
Sheep Creek	N	Y						0	7			20			10	10	10	30		1	50	10	20	20	5	45	1	95	17
Shingle Mill Creek	N	Y					10	10	6			20			10			10		3	40	11	15	20	5	40	2	80	20
Smith Creek	N	Y					10	10	6			20			10			10		3	20	13	15	20	5	40	2	60	24
Snowbank Creek	N	Y		10	10	20		40	3	20		20	20	H				0		4	100	5	20	20	10	50	1	150	6
Spring Cr (Cottonwood)	N	Y		10	10		10	30	4	20		20	20	H	10			10		3	100	5	10	10	10	30	3	130	10
Spring Creek (N F)	Y	Y		10	10	20		40	3	20		20	20	H	10			10		3	110	4	15	10	5	30	3	140	8
Stonewall Creek	N	Y					10	10	6	20		20	20	B	10	10		20		2	90	9	10	20	10	40	2	130	10
Strickland Creek	N	Y						0	7			20			10	10	10	30		1	50	10	10	10	5	25	3	75	21
Sturgeon Creek	N	Y						0	7			20			10	10	10	30		1	50	10	15	20	5	40	2	90	18
Sucker Creek	N	Y					10	10				20	20	H	10	10	10	30		1	80	7	10	10	10	30	3	110	14
Union Creek	Y	Y					10	10	6			20	20	H	10	10	10	30	Y	1	80	7	10	10	10	30	3	110	14
Wales Creek	Y	Y				20		20	5	20			20	H	10	10	10	30	Y	1	90	6	10	10	10	30	3	120	12
Wales Spring Creek	N	Y				20		20	5	20		20			10	10	10	30		1	90	6	10	20	10	40	2	130	10
Ward Creek	N	Y						0	7			20		N	10	10	10	30	Y	1	50	10	10	10	5	25	3	75	21
Warm Springs Cr	N	Y			10			10	6		10	20	20	H	10			10		3	70	8	10	10	5	25	3	95	17
Warren Creek	Y	Y				20		20	5	20		20	20	H	10	10	10	30	Y	1	110	4	15	10	10	35	2	145	7
Warren Creek Doney Lake trib	N	Y					10	10	6					H	10	10		20		2	50	10	10	5	5	20	3	70	22
Washington Creek	N	Y					10	10	6			20		H	10	10	10	30	Y	1	60	9	10	5	10	25	3	85	19
Washoe Creek	N	Y					10	10	6			20			10	10		20	Y	2	50	10	15	20	5	40	2	90	18
Wasson Creek	Y	Y				20		20	5			20	20	H	10	10	10	30		1	90	6	15	20	5	40	2	130	10
West Twin Creek	Y	N		10		20		30	4	20		20			10			10		3	80	7	15	20	5	40	2	120	12
Willow Cr (lower)	N	Y				20		20	5	20		20	20	H	10	10	10	30		1	110	4	10	20	5	35	2	145	7
Willow Cr (upper)	N	Y					10	10	6		10	20			10	10	10	30	Y	1	70	8	15	20	5	40	2	110	14
Wilson Creek	N	Y					10	10	6			20	20	H	10	10	10	30		1	80	7	15	10	5	30	3	110	14
Youmame Creek	N	Y				20		20	5		10	20	20	H	10	10	10	30	Y	1	100	5	10	10	5	25	3	125	11

APPENDIX F

RESTORATION EFFECTIVENESS MONITORING PROTOCOL FOR THE BLACKFOOT WATERSHED

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RESTORATION EFFECTIVENESS MONITORING PROTOCOL FOR THE BLACKFOOT WATERSHED

1.0 INTRODUCTION

The Blackfoot River watershed has been the focus of extensive stream restoration activities over the past several years, with the scope of restoration activities increasing in recent years. Restoration activities undertaken by various entities, including but not limited to, Montana Department of Fish Wildlife and Parks (FWP), the Blackfoot Challenge, and the Big Blackfoot Chapter of Trout Unlimited (BBCTU) have focused on fisheries restoration, water conservation, and mitigation of impaired streams as identified on the State of Montana 303(d) list. Due to the increasing scope of restoration activities in the watershed, and specific needs tied to certain restoration project funding sources, the restoration partners have identified a growing need for an established restoration monitoring program and protocol designed to document the effectiveness of restoration activities in the watershed in terms of immediate and long-term attainment of restoration goals.

This document presents a conceptual plan for restoration effectiveness monitoring in the Blackfoot Watershed. The purpose of this Restoration Effectiveness Monitoring Plan is to provide a common reference for restoration planners to determine appropriate monitoring parameters/activities and protocol to utilize on a given restoration project. Specific objectives of this document include:

- Promoting inclusion of appropriate pre- and post-restoration monitoring in ALL stream and riparian area restoration projects within the watershed;
- Establishing monitoring protocol and procedures to be employed for restoration monitoring to ensure consistency in data collection efforts between projects and between various organizations/agencies involved with stream and riparian area restoration; and
- Providing a tool for use in the planning and design phase of restoration projects throughout the watershed.

Attainment of these objectives will not only assist project planners in the design and implementation of appropriate restoration effectiveness monitoring on their projects, but should also result in a greater degree of consistency in the scope of monitoring, and monitoring methodologies employed, both from project to project and through time. This in turn will lead to development of a comprehensive database of restoration-related data and information collected under consistent methods, thus facilitating informational sharing among projects and, potentially, reduced monitoring costs in the long-term.

This Restoration Effectiveness Monitoring Plan is intended to serve as a guide to restoration project monitoring. The plan outlines various monitoring activities that should be considered for inclusion on restoration projects, depending on the restoration project objectives and/or

impairment conditions associated with the project. The specific scope of monitoring to be applied for a given project should be determined by the individuals and agencies involved in the project, with the scope of monitoring dependent on specific project needs as well as possible budget constraints. However, it is hoped that through consultation of this plan, all restoration projects will be monitored to the extent necessary to allow determination of the effectiveness of the restoration action, with a level of consistency in monitoring methodology so that data may be used by other restoration and land use planners in the watershed.

This document is designed to be a quick reference for restoration planners evaluating potential monitoring needs for their projects. Section 2 outlines monitoring parameters/activities, such as stream substrate characterization or water temperature monitoring, that may be applicable to restoration projects based on project objectives and goals, and stream impairment conditions. Section 3 summarizes actual protocol, or methodologies, to be employed for specific parameter measurement (i.e., streamflow measurement by USGS protocol).

2.0 RESTORATION EFFECTIVENESS MONITORING METRICS

Appropriate measures of restoration effectiveness will vary depending on the particular goals and objectives of the restoration project, be they restoration of aquatic habitat, maintenance of in-stream flow, or irrigation efficiency improvements. The various types of metrics used to assess the status of a water body generally include biological, physical, and chemical measurements. Table 2-1 shows suggested metrics to be used for restoration projects depending on the restoration goals and/or the particular water body impairment.

Biological metrics are particularly appropriate for many types of restoration effectiveness monitoring, due to their capacity to provide information on overall stream health by integrating the effects of many potential sources of impairment. For example, fish populations and macroinvertebrate community structure and abundance both will respond favorably to improvements in aquatic habitat and riparian conditions, as well as reductions in loads of specific pollutants such as nutrients or metals. Measurements of pollutant concentrations through water quality sampling should, if possible, be supplemented by one or more biological metrics to provide a more comprehensive representation of stream status and response to restoration activities. Note that biological metrics are typically more labor-intensive and expensive to conduct than water quality sampling; therefore, careful planning is important for conducting biological surveys.

As shown in Table 2-1, each restoration project category has multiple monitoring metrics identified as potentially applicable with some categories, such as "Excess Siltation in Stream Substrate", showing the majority of metrics as applicable. This does not mean that all of the identified monitoring metrics need be, or should be, included. Instead, a suitable suite of parameters should be selected by project planners based on the specific project scope and needs, as well as availability of funding. It should also be noted that the list of monitoring metrics in Table 2-1 is by no means exhaustive. For instance, the methods included for quantifying stream substrate composition (percent fine content measurements and McNeil core sampling), represent only two of numerous methods available for stream substrate characterization. Other common methods, such as Wohlman Pebble Counts and Riffle Stability Index, may be equally as applicable. However, the list of metrics included in this document are intended to provide a reasonable spectrum of measurement options, from relatively simple semi-qualitative methods to more intensive methods, to fit most project needs and budgets. The number of methods has intentionally been kept short in order to promote consistency in the data collection methodology throughout the watershed. Specific monitoring protocols are summarized in Section 3.

TABLE 2-1. RESTORATION EFFECTIVENESS MONITORING METRICS APPLICABLE TO VARIOUS RESTORATION OBJECTIVES/IMPAIRMENT SOURCES

METRICS	RESTORATION PROJECT OBJECTIVES/IMPAIRMENT CAUSES							
	In-Stream Flow Maintenance	Habitat Restoration	Reduce Substrate Siltation	Reduce Thermal Modification	Reduce Ag Runoff	Riparian Area Restoration	Reduce Elevated Metals	Reduce Elevated Nutrients
BIOLOGICAL METRICS								
Fish Population Surveys	X	**X**	X	X	X	X		
Redd Counts	X	**X**	X	X	X	X		
Macroinvertebrate Sampling	X	X	X	X	X	X	X	X
Periphyton Sampling	X	X	X	X	**X**			X
Chlorophyll-a					**X**			X
PHYSICAL PARAMETERS								
Habitat Assessments	X	**X**				**X**		
Riparian Assessment		X	X	X	X	**X**		
Water Temperature	X	X	X	**X**	X	**X**		
Flow Monitoring	**X**			X			**X**	**X**
Photo Points	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
WATER CHEMISTRY								
TSS Samples			**X**		**X**		X	X
Nutrient Sampling					**X**			**X**
Metals Sampling							**X**	
STREAM SUBSTRATE COMPOSITION								
McNeil Core Samples		X	**X**			X		
Percent Fine Sediment Content		X	**X**			X		

X – Metrics marked in bold should be given primary consideration for monitoring
TSS- Total Suspended Sediment

3.0 RESTORATION MONITORING PROTOCOL

The following monitoring protocols represent methodologies and practices generally accepted and commonly used for biological, physical and chemical characterization of aquatic and riparian systems. These protocols have been compiled by the Blackfoot Challenge, with input from various restoration partners. For instance, the Department of Fish, Wildlife and Parks provided methodologies for fish population surveys, redd counts, habitat assessments, and water temperature monitoring. FWP has been the primary entity performing these monitoring activities in the past, and should be consulted when these monitoring activities are being considered for restoration projects.

3.1 BIOLOGICAL MONITORING

3.1.1 Fish Population Surveys

Depending on the survey objectives, fish population surveys take many different forms. Methods generally involve fish collections using traps, seines, electrofishing or other methods. In some cases, population surveys may involve direct observations of fish (eg. Snorkeling) or of spawning activity (redds). Restoration-related fish population surveys often involve electrofishing means. These methods usually involve some quantification of densities or biomass using single-pass, mark-recapture, or multiple pass-depletion methods. Other information typically collected includes age/length structure, species identification

3.1.2 Redd Counts

Counting spawning sites (redds) is a standard method of assessing the numbers of adult spawning fish within a spawning area or for a given population. Redd counts are not considered a usefull method for certain spring spawning fish in environments where to high water and turbidity confounds the identification of redds. Redd counts work best for fall spawning fish (brown trout and bull trout) or in spring creeks. Counts were made by walking the spawning areas shortly after the spawning period. Redd areas were identified by a cleaned, oval shape (pit), and a mound of unconsolidated gravel (tailspill) left by the females digging activities. Only redds where a definite pit and tailspill were discernable are counted. Redd counts are often made in index reaches where surveys are completed annually in order to assess population trends.

3.1.3 Macroinvertebrate Sampling

In instances where restoration project objectives include fisheries restoration, pre- and post-restoration macroinvertebrate sampling should be considered. Besides serving as an indicator for general water quality and substrate conditions, macroinvertebrate populations represent an integral component of a functioning biological system and will therefore help in determining restoration project success and/or beneficial use support associated with aquatic life. Careful consideration should be given to the need for and utility of macroinvertebrate sampling due to the considerable expense.

Procedure:

When conducting macroinvertebrate sampling, two general methods can be used; the quantitative and qualitative methods. The quantitative sampling method uses a Hess or Surber sampler, and is the preferred sampling method. When sampling by the quantitative method, sampling should include collection of multiple samples (replicates) at each site to allow for statistical analysis of the data. Typically, between 3 and 8 replicate samples are recommended depending on the suspected site variability, level of analysis required, and budgetary constraints. In most cases, 4 replicate samples per site should suffice for evaluating restoration effectiveness. The qualitative method uses a kick net for sample collection. The qualitative method is quicker and generally less expensive than the quantitative method, but yields less reliable results.

Macroinvertebrate sampling should be performed by experienced personnel following MDEQ's Rapid Bioassessment Protocols, Standard Operating Procedures 12.1.3.1 (Quantitative Method) or 12.3.1.2 (Qualitative Method). The MDEQ protocols are available upon request from the Blackfoot Challenge, or at:

http://www.deq.state.mt.us/wqinfo/monitoring/SOP/pdf/12-1-3.pdf

If preferred, comparable procedures, such as the EPA Rapid Bioassessment Protocol, can be used provided they are consistent with substantive portions of the MDEQ protocol. When quantitative macroinvertebrate sampling is performed, it should also be performed in a manner consistent with the Status and Trends macroinvertebrate sampling to allow for comparison to the basin-wide Status and Trends data.

Monitoring Sites/Schedule:

Due to the considerable cost associated with macroinvertebrate sample analyses, careful consideration should be afforded to selection of sampling locations and schedules. Ideally, a minimum of two sampling sites should be established within and/or downstream of the restored stream segment. However, if budget constraints dictate, one sampling site properly located within the restored segment may suffice (see MDEQ SOPs for sample site selection). Once established, sampling sites should be photographed, and described using the Rapid Bioassessment Protocol Physical Evaluation Form and Contractor Evaluation Form provided with the MDEQ SOPs.

Macroinvertebrate sampling should occur at least once prior to and once after restoration. Sampling should occur after runoff, preferably in August/September, although samples can be collected later in the year if necessary. Sampling should not be conducted immediately after large storm-related runoff events.

3.1.4 Periphyton/Chlorophyll a Sampling

Periphyton refers to the assemblage of algae living attached to or in close proximity to the stream substrate. These assemblages represent the principle source of primary productivity in most Montana streams. In general, excessive crops of periphyton are indicators of poor

water quality, particularly elevated nutrient concentrations. In addition, species composition, diversity and abundance can be used as a measure of overall stream ecological health, since different species show variable sensitivity to potential impairment causes such as temperature, nutrients, and toxic constituents. Periphyton analyses may include quantification of chlorophyll a, and/or taxonomic identification to varying levels of precision. The methods chosen will depend on the specific project objectives.

Procedure:

MDEQ protocol divides periphyton sampling into three tasks of increasing complexity:

- Field observations;
- Standing crop/chlorophyll a sampling; and
- Community composition and structure sampling.

Field observations include completion of an Aquatic Plant Field Sheet, which records information on general composition, amount, color, and condition of aquatic plants and is equivalent to a Level I Rapid Bioassessment Protocol for plants (similar to the RBP for macroinvertebrates). Semi-quantitative assessments of biomass and taxonomy may also be conducted using a field-based rapid periphyton survey technique, which involves use of a gridded viewing bucket and a biomass scoring system.

Collection of samples for chlorophyll a analysis can include targeted sampling (sampling of heaviest accumulations of attached algae in a sampling transect), or more random sampling and direct extraction of chlorophyll a from streambed rocks. In both cases an estimate of amount of chlorophyll a per unit area of streambed is generated. Finally, collection of samples for laboratory identification of community composition and structure basically involves scraping rock surfaces, lifting algal film from nearshore sediments, and scraping several submerged branches.

Standard Operating Procedures for periphyton and chlorophyll a sampling have been developed by MDEQ, and are available at the following web address (comparable procedures may also be used):

http://www.deq.state.mt.us/wqinfo/monitoring/SOP/pdf/12-1-2-0.pdf

Monitoring Sites/Schedule:

Similar to macroinvertebrate analysis, periphyton analysis (identification of community structure and composition) is a time-consuming, labor-intensive, and thus relatively expensive endeavor. Thus, the objectives of sampling and the potential data uses should be thoroughly assessed prior to collecting samples for periphyton. Ideally, a reference site should be established to evaluate baseline conditions, in addition to 1 or 2 monitoring locations within and/or downstream of the restored stream section. For high-gradient streams, one periphyton sampling site should cover a single riffle, while in low-gradient streams, the sampling site should consist of at least one meander length (about 20 bankful channel widths).

The recommended time for periphyton sampling is summer (late June through September). During this period, stream flow is relatively stable, and most streams exhibit peaks of both periphyton standing crop (biomass) and community diversity. If temporal trends are to be assessed by repeated sampling over a number of years, the time of sampling should remain consistent from year to year to minimize seasonal variance.

3.2 PHYSICAL PARAMETERS

3.2.1 Habitat Assessments

Methods of assessing aquatic habitat vary greatly depending on the scale of the project and the specific survey objectives. An excellent reference for determining scale and objectives is found in Aquatic Habitat Assessment: common methods (Bain and Stevenson, 1999). At a restoration project level, habitat survey methods should focus on survey precision and repeatability necessary for post-project evaluation. Habitat surveys almost always involve a longitudinal and areal description of channel bed forms including pools, riffles and channel complexity. Habitat survey methods often involve geomorphic assessments, stream bank condition and riparian health, measurements of flow, water temperature and water quality, substrate compositions and instream wood counts.

3.2.2 Riparian Assessment

Assessment and monitoring of riparian areas is a critical step in assessing riparian system health. Initial stream reach inventories can be used as indicators of problem areas and identification of potential solutions to unstable stream situations. These same assessment techniques can also be used to observe changes over time, especially to gauge progress in restoring health and vigor to riparian systems functioning at levels below their potential.

Vegetation in stream zones is the best terrestrial indicator of stream health and function. Healthy vegetation within the watershed, especially within the riparian corridor, is the best indicator of a proper functioning stream system from a biological and hydrological perspective. Vegetation is also the component of a watershed over which a land manager has the most influence.

Consequently, when riparian vegetation is not in a healthy state, management changes may be warranted. Riparian areas are complex systems and thus present numerous options to the land manager to make positive changes in management, especially when dealing with grazing animals. If management of these areas is part of an unhealthy stream system, management changes must then be part of any solution to enhance riparian health. Downward trends in vegetation health can be reserved relatively quickly with positive changes in management of grazing animals.

Physical and biological processes occurring in riparian areas are sustainable in a healthy stream system. These processes are complex but need to be in balance to maintain a proper functioning, stable system. Inventory, assessment techniques used to gauge the health of these systems therefore need to account for this complexity.

Two riparian assessment techniques are recommended for use in the Blackfoot Watershed, as described below. Both techniques account for the complexity of riparian systems, yet are relatively user friendly to those familiar with inventory techniques, and also provide repeatable, quantifiable data. Whatever process is used for an initial inventory of the riparian system, it should quantify current condition, assess problems, and be repeatable. The first method was developed by the NRCS and is a relatively quick means of assessing riparian conditions. The second method is the USFS Green Line method, which is slightly more complex, yet should be readily implementable on most restoration projects. The appropriate method to use for specific restoration projects should be based on the project scope and budget, and importance of riparian conditions to the project goals and objectives.

The first riparian evaluation recommended for use in the Blackfoot Watershed is the Riparian Assessment procedure and field form developed by the USDA NRCS (USDA, 2004). This evaluation gives the user a good overview of a particular stream reaches status of the ecological and physical processes interacting at a site. This assessment will indicate problem areas within a stream system and yields a numeric rating which can be used to indicate trends through time. This evaluation technique is a relatively quick method for trained observers to utilize and will indicate specific physical or biological problems for more detailed inventory/analysis. The NRCS protocol document and filed forms are available at the following website, or from the Blackfoot Challenge upon request:

http://www.mt.nrcs.usda.gov/technical/

The stream reach evaluated should be well identified and documented (e.g. gps points, aerial photography, photo points) so that future evaluators can locate the same site. All pertinent observations should be recorded on the enclosed forms to enable future reference. The more notes/observations recorded during an assessment, the easier it will be for future evaluators to visualize the current conditions.

The second riparian evaluation method recommended for use is Monitoring the Vegetation Resources in Riparian Areas, USDA Forest Service, Technical Report RMRS-GTR-47 (USDA, 2000). Since vegetation is a key component in evaluating riparian health, this method zeroes in on one of the key monitoring tools for streams. This monitoring technique does require some technical knowledge of riparian vegetation, and thus should only be used when a more quantitative analysis of the riparian situation is desired. For example, when a grazing management problem is identified, a more detailed evaluation of the current vegetation condition may be warranted to enhance management changes. This monitoring technique also provides a more quantitative measure of vegetation trends through time. Sites where this technique is employed should again be accurately documented to ensure that assessment reaches can be relocated in the future.

The publication RMRS-GTR-47 is available form the Blackfoot Challenge upon request. The document can also be ordered from the USDA Forest Service Rocky Mountain Research Station at phone number (970) 498-1392, or downloaded from:

http://www.fs.fed.us/rm

3.2.3 Water Temperature

Water temperature measures now include programmable miniature temperature loggers. These loggers collect time and temperatures at user-defined intervals. Loggers can be record for several years if needed. Loggers can be downloaded in a manner that provide maximum, min and mean temperature values or as continuous data. Data can be easily manipulated in computer programs like EXCEL or can be statistically manipulated.

3.2.4 Flow Monitoring

Streamflow measurements should be recorded anywhere that restoration goals include maintenance of in-stream flow. In addition, accurate flow measurements are necessary for calculating loads of chemical constituents (e.g., nutrients, metals) within a water body. Streamflow measurements should be collected using one of three general methods, depending on the channel geometry and stream or seep discharge rate:

- Velocity-area method;
- Portable trapezoidal flume; or
- Volumetric method.

The velocity-area method is used to measure streamflow in larger, wadeable streams. Measurement of streamflow is performed in accordance with the area-velocity method developed by the USGS (USGS, 1977). In general, the entire stream width is divided into subsections and the stream velocity measured at the midpoint of each subsection and at a depth equivalent to six-tenths of the total subsection depth. The velocity in each subsection is then multiplied by the cross-sectional area to obtain the flow volume through each subsection. The subsection flows are then summed to obtain the total streamflow rate. Streamflow measurements are typically collected in a stream reach as straight and free of obstructions as possible, to minimize potential measurement error introduced by converging or turbulent flow paths. Streamflow measurement data should be recorded on specially prepared forms available from the Blackfoot Challenge.

Streamflow measurements on smaller streams or seeps are obtained using a portable flume such as a 90° v-notch cutthroat flume. This flow measurement method is based on equations developed by Skogerboe et al (1967). To measure streamflow, the flume is placed and leveled in the streambed, and the full streamflow directed through the flume throat. Water depth or head measurements are then collected at specified locations in the upstream (H_a) and downstream (H_b) sections of the flume. The head measurements are used to verify proper functioning of the flume and to calculate streamflow based on the water depth.

Collection of volumetric flow measurements consists of directing the flow into a container of known volume (such as a five-gallon bucket), and recording the time required to fill the known volume. Volumetric flow measurements are typically limited to monitoring points with small seepage flows (which can be diverted into a container) and discrete discharge points such as culverts and pipes.

3.2.5 Photo Point Monitoring

Photo points should be established for all restoration projects to assure collection of adequate pre- and post-restoration photographs. Pre- and post-restoration photos are invaluable for visually portraying large scale changes in response to restoration activities and in presenting such information to the general public. Following are a few simple rules that should be applied when establishing photo points to ensure that Pre- and post- project photos capture the level of information desired.

- Photo points should be selected and established in the earliest stages of the project. This will allow pre-restoration photos to be taken for all seasons.

- Photo points should be permanently marked to facilitate future relocation and identification. Once selected, photo points should be marked in the field with a steel or wood stake and GPS coordinates recorded. Photo points should be assigned a unique site code name and the marker stake inscribed with the site code.

- Long view photos representative of the entire or large portion of the project area should have a distinct permanent landmark in the background such as a mountain peak, rock outcrop, etc. Other considerations when choosing photo point locations include:

    - Locations should be easily relocatable and accessible;
    - Make sure that future plant growth will not obscure view; and
    - Select sites that will portray the level and depth of information applicable to the project.

- Information on project photos should be recorded on special project photo forms for systematic documentation into a project photolog. Forms should include information such as: Project name and location; Photo point number and location; Direction of photo; Photograph date, time, and weather conditions; Photographers name; Dates of previous photos, if known; and any comments/notes by the photographer.

3.3 WATER QUALITY MONITORING

Water quality monitoring needs for specific projects will depend on the restoration project objectives and the specific causes of impairment. In most cases, water quality monitoring needs will include nutrients, sediment, and/or metals. Monitoring for each of these general parameter groups is described below.

3.3.1 General Water Sampling Procedures

Procedure

The USGS has published water quality monitoring protocol for sampling of metals, nutrient, and suspended sediment concentrations. These methods are widely accepted and used for water quality monitoring across Montana. Restoration effectiveness water quality monitoring conducted within the Blackfoot River drainage should be completed in

accordance with USGS protocol, or in accordance with comparable methods such as MDEQ protocol. USGS procedures are available at the following web address:

http://water.usgs.gov/owq/FieldManual/

Current MDEQ procedures are available at:

http://www.deq.state.mt.us/wqinfo/monitoring/SOP/sop.asp

Streamflow rates should be measured in conjunction with all water quality monitoring events to allow parameter loads (mass/time) to be calculated from parameter concentrations (mass/volume) determined through sampling. Comparison of parameter loads at multiple locations along a stream can be used to determine where load increases occur, and thus where sources of contaminant loading are located. Streamflow measurement should be performed as described in Section 3.2.

Monitoring Sites and Schedule

When water quality sampling is performed to assess restoration effectiveness, samples should be collected upstream of the restoration area in addition to sampling within and downstream of the restored stream reach. Sampling upstream of the restoration project will document the quality of surface water entering the restoration stream reach, allowing variations in upstream water quality to be taken into account when evaluating restoration project effectiveness. For restoration projects encompassing relatively short segments of stream (1,000 feet or less), one monitoring site near the upstream boundary and a second site near the downstream boundary will generally be sufficient. For stream restoration projects encompassing longer stream segments, one or more internal monitoring sites should be added to document water quality trends through the project area.

A minimum of one pre-restoration and one post-restoration monitoring event is required to assess restoration effectiveness from a water quality improvement perspective. However, due to intrinsic variability in surface water quality due to streamflow and climatic conditions, multiple pre- and post-restoration monitoring events should be conducted over a number of years. Ideally, water quality data should be collected from various portions of the streamflow hydrograph, with the specific sampling schedule dependent on the water quality parameters of interest. For instance, sampling for metals concentrations should be performed during the rising limb and falling limb of the spring runoff peak and during baseflow conditions since different metals loading sources will predominate under differing flow conditions (see discussion below). Conversely, nutrient sampling should focus on summer and early fall baseflow conditions when nutrient-related water quality problems are generally most severe. Pre- and post-restoration data used for evaluating restoration effectiveness should be collected under similar climatic conditions since runoff from heavy precipitation events can greatly affect short-term water quality. In general, a minimum of three pre- and post-restoration monitoring events should be preformed under appropriate flow and climatic conditions to allow restoration effectiveness to be evaluated with a reasonable level of

confidence. Following is additional detail on monitoring protocol for specific water quality parameters.

3.3.2 Nutrient Sampling

Although nutrient pollution can result from a wide variety of sources, nutrient-related impacts to streams in the Blackfoot watershed will most likely be associated with agricultural runoff. Therefore, water quality monitoring for nutrients should be conducted for restoration projects associated with agricultural sources, and/or where the stream has been identified as impaired due to nutrients. In these cases, pre- and post-restoration water samples should be collected at the upstream and the downstream ends of the restoration project.

Table 3-1 includes a list of typical nutrient parameters for restoration projects, including total phosphorus, orthophosphate, nitrate plus nitrite (as nitrogen), ammonia (as nitrogen) and total kjeldahl nitrogen. This list will allow discrimination of the primary organic and inorganic forms of nitrogen and phosphorus. Samples for all parameters (except total phosphorus) should be filtered through a 0.45-micrometer filter in the field prior to placement in the sample container to remove particulate matter from the water sample that could affect analytical results.

When conducting nutrient sampling, the pre- and post-restoration sampling should be conducted during the same time of the year to prevent seasonal variations in nutrient concentrations from affecting the pre- and post-restoration comparison. Nutrient sampling should be performed during the summer months when water quality impacts from nutrients are expected to be greatest. Precipitation trends during and prior to sampling should be noted since runoff from intense precipitation events can greatly affect nutrient concentrations in streams through agricultural runoff.

TABLE 3-1. ANALYTICAL PARAMETERS, SAMPLE REQUIREMENTS FOR NUTRIENT SAMPLING

Parameter	Detection Limit	Container	Preservation	Holding Time
Total Phosphorus	0.01 mg/l	250 ml polyethylene	Add H_2SO_4 to pH<2, cool to 4°C	28 days
Orthophosphate	0.01 mg/L	250 ml polyethylene	Filter to 0.45 micron, add H_2SO_4 to pH<2, cool to 4°C	28 days
Nitrate+Nitrite as N	0.05 mg/L	50 ml polyethylene	Filter to 0.45 micron, add H_2SO_4 to pH<2, cool to 4°C	28 days
Ammonia as N	0.1 mg/L	50 ml polyethylene	Filter to 0.45 micron, add H_2SO_4 to pH<2, cool to 4°C	28 days
Total Kjeldahl Nitrogen (TKN)	0.5 mg/L	500 ml polyethylene	Filter to 0.45 micron, add H_2SO_4 to pH<2, cool to 4°C	28 days

3.3.3 Suspended Sediment Sampling

Total suspended sediment (TSS) monitoring will serve as the primary indicator of the effectiveness of restoration projects on water column sediment concentrations. Although other measures of water column sediment conditions (such as turbidity) are available, TSS monitoring represents the most direct measure of sediment levels within the water column available. Table 3-2 includes details on sample collection and handling for TSS.

Suspended sediment (or water column sediment) sampling will be applicable to many projects in the Blackfoot watershed due to the widespread nature of sediment-related impairment in the drainage. Excessive suspended sediment is not only detrimental to fish and other aquatic life, but also interferes with other beneficial uses such as irrigation water and drinking water supplies. Elevated suspended sediment concentrations also are indicative of or related to a myriad of other water quality problems and impairment causes, such as riparian degradation, agricultural runoff, substrate siltation, and elevated metals and nutrient concentrations. Therefore, documenting changes in suspended sediment concentrations through proper monitoring will be applicable to the majority of restoration projects in the Blackfoot watershed.

Pre- and post-restoration sampling for TSS must be performed under similar conditions to reduce the effects of natural variability in TSS concentrations. For instance, pre- and post-restoration samples should be collected from similar points on the annual hydrograph (rising limb, falling limb, baseflow) and during similar climatic conditions (extended dry periods, during or shortly after significant precipitation events), to exclude flow and weather-induced variations in TSS concentrations from the restoration effectiveness assessment. A minimum of three pre- and post-restoration TSS monitoring events should be performed under various

hydrologic and climatic conditions to adequately document restoration success. Monitoring should occur at the upstream and downstream boundary for smaller restoration projects (on the order of 1,000 feet in length), with one or more internal sites added for longer restoration projects.

TABLE 3-2. ANALYTICAL PARAMETERS AND SAMPLE REQUIREMENTS FOR TOTAL SUSPENDED SOLIDS SAMPLING

Parameter	Detection Limit	Container	Preservation	Holding Time
Total Suspended Solids	10 mg/L	1000 ml glass or plastic	Cool to 4°C	7 days

3.3.4 Metals Sampling

Monitoring of metals concentrations in surface water should be performed on all restoration/reclamation projects designed to reduce metals loading to surface waters. This may include abandoned mine reclamation projects or mitigation of other metals loading sources. When monitoring metals concentrations in stream restoration projects, the objectives are to determine how restoration activities affect in-stream metals concentrations, and to determine how post-restoration concentrations compare to applicable water quality standards presented in Circular WQB-7, the official list of Montana Numeric Water Quality Standards published by MDEQ.

Table 3-3 includes sample collection and handling requirements for metals analyses. Typically, metals of interest in assessing surface water quality may include aluminum, arsenic, cadmium, copper, iron, lead, manganese, zinc, or numerous other metals. Actual metals to be analyzed for a project should be based on specific metals impairments or loading sources. On projects where information on specific metals of concern is lacking, the above list of metals should be sufficient for documentation of metals impairment and restoration effectiveness.

With the exception of aluminum, all metals should be analyzed for total recoverable concentrations for comparability to the water quality standards. If applicable, aluminum should be tested for dissolved concentrations (sample should be filtered through 0.45 micron filter prior to acidification) since the aluminum standard is based on the dissolve concentration. Although not typically considered a pollutant, the metals calcium and magnesium should be included in metals sample analyses to determine the water hardness. Because water quality standards for certain metals are dependent on the water hardness,

calcium and magnesium concentrations should be used to determine the water hardness by the following equation:

$$H = [Ca^{2+} \times 2.497] + [Mg^{2+} \times 4.117]$$

Where: H= water hardness (as CaCO3) in mg/L
Ca^{2+} = dissolved calcium concentration
Mg^{2+}=dissolved magnesium concentration.

Similar to other water sampling protocol, pre- and post-restoration sampling for metals should be performed during similar hydrologic and climatic conditions to reduce the effects of natural variability in metals concentrations. A minimum of two pre- and post-restoration metals monitoring events should be performed under various hydrologic and climatic conditions to adequately document restoration success. Monitoring should occur at the upstream and downstream boundary for smaller restoration projects (on the order of 1,000 feet in length), with one or more internal sites added for longer restoration projects.

TABLE 3-3. ANALYTICAL PARAMETERS AND SAMPLE REQUIREMENTS FOR METALS SAMPLING

Parameter	Detection Limit	Container	Preservation	Holding Time
TRC Metals	*	250 ml polyethylene	Add HNO3 to pH<2, cool to 4°C	6 mos
Dissolved Calcium, Magnesium	1.0 mg/L	50 ml polyethylene	Filter to 0.45 micron, add HNO_3 to pH<2, cool to 4°C	6 mos
Dissolved Aluminum (if applicable)	0.05 mg/L	50 ml polyethylene	Filter to 0.45 micron, add HNO_3 to pH<2, cool to 4°C	6 mos

TRC-total recoverable. Specific list of metals to be analyzed dependent on project needs but may include arsenic, copper, cadmium, iron, lead, manganese, zinc, or other metals of interest.
*Varies with metal. Detection limits for individual metals should be less than applicable water quality standard in WQB-7.

3.4 STREAM SUBSTRATE COMPOSITION

Stream substrate composition, or the distribution of sediment particle sizes in streambed sediments, can be an important measure of success and effectiveness for many stream restoration projects. Excessive fine sediment content, typically taken to be any sediment particles less than approximately 6 mm in size, can be detrimental to aquatic life and other beneficial uses. Changes in the fine sediment content of the stream substrate are also a useful measure of the effectiveness of specific restoration measures and objectives, such as reducing sediment runoff from roads or unstable streambanks. Following are two methods for documenting stream substrate composition before and after restoration actions. The Percent Fines Content method is a relatively simple measurement yielding semi-quantitative information on substrate composition, while the McNeil Core Sampling method provides more quantitative information. The specific method used on a project should depend on the scope of the project, importance of streambed siltation to the stream health and project objectives, and available funding. Other methods, such as Wohlman pebble counts, riffle

stability index, etc., may also be considered as long as standard methodologies are employed. Whichever method is chosen, the same method must be applied for the pre- and post-restoration monitoring to allow for direct comparison of the results.

3.4.1 Percent Fine Content

Procedure

Percent fines content is calculated using a five-gallon bucket fitted with a clear plastic bottom. The bottom is marked with a grid of one-inch spaced lines, with a 6 mm wide space demarcated at each intersection. The bucket is then placed in the water, and the streambed viewed through the bucket. At each grid intersection (a total of 45), the size of the sediment particle below the intersection (greater than or less than 6 mm), is recorded. The percent fines content is than calculated from the percentage of intersection points with sediment particles less than 6mm. The procedure is described in MDEQ Standard Operating Procedure 11.8.6, Percent Fines Calculation at the following website:

http://www.deq.state.mt.us/wqinfo/monitoring/SOP/pdf/11-8-6.pdf

Monitoring Sites/Schedule

Percent fine sediment measurements should be taken in pool tails and riffles, with the distribution of measurements dependent on the relative abundance of each. For instance, if the reach contains 70% riffles and 30% pools, 70% of the measurements should be taken from riffles and 30% from pools. The total number of measurements to be taken depends of the size and variability of the stream in the restoration area, and importance of stream substrate composition to the project. A sufficient number of measurements should be made to adequately characterize the percent fines content of the stream substrate for the project purposes.

3.4.2 McNeil Core Samples

McNeil core sampling provides more quantitative information on stream substrate composition than does the Percent Fine Content method, but is also more labor and equipment intensive. McNeil core sampling also requires that sediment samples be analyzed for grain size distribution, adding additional costs. However, collection of McNeil core samples should be considered where documentation of the percent fine sediment content in stream substrate before and after restoration is critical to project objectives.

The Helena National Forest has been conducting McNeil core sampling in the Blackfoot watershed for the past several years, resulting in an existing database of McNeil core data from the drainage. In order to ensure comparability of future restoration project sampling results with the existing database, McNeil core sampling performed for restoration projects should be conducted in a manner consistent with the HNF methodology. The following protocol was provided by the Helena National Forest. The general procedure is as follows:

Required Equipment:

- GPS Unit
- McNeil core sampler
- 1000 ml Imhoff cone
- 500 ml plastic bottle
- 5 gallon bucket with plastic bag liner

Field Data to be Recorded:

- Stream Name /Date /Location
- Observer Name
- Depth of core (6" for bull trout spawning gravel and 4" for cutthroat spawning areas)
- Site # and Core # with a description of the start point and the distance between points.
- Number of redds located at the site.
- GPS location
- Suspended sediment measure (ss) – The measurement of the depth of the water taken within the core sampler after the sample has been pulled into the reservoir, but the sampler is still in the stream.
- Imholf cone measure (Imh) – Let the sample settle for approximately 20 minutes. If using a 500 ml bottle – double the total sediment reading in the cone (1000 ml) and multiply by 0.4. This will account for how much it would actually settle overnight.

Field Procedure:

- Locate a spawning site or a potential spawning site. (All successive sites will be located upstream from the first site.)
- Set up 5-gallon bucket with a plastic bag inside.
- Set up Imhoff cone.
- Write two identification tags on the flagging for each sample using a waterproof marker. One tag is short and will be placed inside the plastic bag with the sample and the other is long and will be used to tie the sample bag when finished. The tags contain the following information: Stream Name, Site #, and Core #.
- Place core sampler next to the existing redd, but not where it would be affected in any way by the coring (remember your feet). If the site is a potential site, place the core sampler where you would expect a redd.
- In a bull trout stream, take 6" of core, or 4" from the top of the inner rim on the McNeil sampler. (The inner cylinder is 10".)
- In a cutthroat stream take 4" of core, or 6" from the top of the inner rim on the McNeil sampler.
- When drilling the core into streambed, try not to let it walk over the stream bottom. If it hangs up on a large rock go ahead and re-core. If a piece of rubble is too big to fit through the 10" cylinder leave it out of the sample.
- Once the core sampler is down to the appropriate depth, remove the material from the inner 10" cylinder and place into the inner reservoir. You are finished when you feel the top of the teeth at the bottom of the sampler.
- Use the ruler to measure the depth of the water from the bottom of the core sampler.

- Quickly fill the 500 ml bottle to capture the suspended sediments and pour it into the Imholf cone.
- Slowly pull up the core sampler and place it on the 5 gallon bucket with the bag around the 10" cylinder.
- Empty the sample from the reservoir into the plastic bag through the 10" cylinder. Use extra wash water to carefully wash the extra sediment from inside the core sampler. Pick up the sampler and drain the rest of the water into the bag.
- Remove the bag from the plastic bucket and pour any remaining sediment and water into the bag.
- Place the short tag inside the bag.
- Twist the bag and tie it with many wraps of the long flagging.
- Record the GPS reading, the ss depth in inches and the Imholf cone reading. Empty the water from the cone using the cap at the bottom and then replace it tightly! (Easy to lose.)

Sample Analysis:

- Samples are processed by passing the sample through a set of soil sieves and recording the weight of soil passing through each sieve. The percent passing each sieve is then plotted against the sieve sizes on a semi-log plot to provide the grain size distribution of the sample. Samples should be passed through a stack of sieves consisting of the following sieve sizes:

Sieve Number	Opening Size (mm)
200	0.074
20	0.85
8	2.38
4	4.76
3	6.3
0.5"	12.7
1.0"	25.4
2.0"	50.8
3.0"	76.1

From the resulting data, the percent fine sediment can be determined. Other useful metrics, such as the Fredel Index and sorting coefficient, can also be calculated.

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APPENDIX G

GUIDING DOCUMENTS FOR THE RESTORATION ACTION PLAN

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